Appendix B
Additional Information on Standards and Guidelines

This appendix contains additional information about specific standards and guidelines or processes. The individual alternative descriptions in Chapter 2 indicate when and how these elements apply to each alternative.

B1. Revised Preferred Alternative - Description of the Bureau of Land Management's Revised Preferred Alternative (USDI BLM unpub.), which was developed following receipt of public comments to the August 1992 Draft Resource Management Plans.

B2. Ecological Principles for Management of Late-Successional Forests - This section is adapted from the FEMAT Report to provide additional information on the objectives and assumptions regarding management of late-successional forests.

B3. Adaptive Management Areas - Describes overall objectives for Adaptive Management Areas and provides specific objectives for each particular area. Adapted from the FEMAT Report.

B4. Protection Buffers - Additional standards and guidelines for other species in the upland forest matrix. Adapted from the Scientific Analysis Team Report (Thomas et al. 1993).

B5. Recovery Plan Standards and Guidelines - Standards and guidelines for management of federal lands, adapted from the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.).

B6. Aquatic Conservation Strategy - Excerpts from Chapter V of the FEMAT Report specific to delineation and management of Riparian Reserves, Key Watersheds, watershed analysis, and watershed restoration.

B7. Late-Successional Reserve Standards and Guidelines - Late-Successional Reserve standards and guidelines for multiple-use activities other than silviculture. Adapted from the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.).

B8. Fire Management Standards and Guidelines - Consolidation of the standards and guidelines of the FEMAT Report to provide clarification of fire and fuels management objectives.

B9. BLM Spotted Owl Standards and Guidelines - Standards and guidelines retained or adapted from the BLM Revised Preferred Alternative (USDI BLM unpub.) that are specific to northern spotted owl habitat.

B10. Grants Pass Line - Line between northern and southern General Forest Management Areas, from the map of the Preferred Alternative, Draft Medford District Resource Management Plan and Environmental Impact Statement (USDI BLM 1992d), August 1992.

B11. Standards and Guidelines Resulting from Additional Species Analysis and Changes to Alternative 9 - Standards and guidelines developed to increase protection of habitat for species whose habitat assessments were relatively low under Alternative 9 in the Draft SEIS.

Appendix B1
Revised Preferred Alternative

Description of the Bureau of Land Management's Revised Preferred Alternative Which was Developed Following Receipt of Public Comments to the August 1992 Draft Resource Management Plans. This section applies to all alternatives.

Preface

In August 1992, the Salem, Eugene, Coos Bay, Roseburg and Medford Districts and the Klamath Falls Resource Area of the Lakeview District of the Bureau of Land Management (BLM) published Draft Resource Management Plans and Environmental Impact Statements (RMP/EISs) (USDI BLM 1992a-f). This portion of Appendix B contains part of an unpublished draft document that summarizes the BLM revision intended for the Draft RMP/EISs for western Oregon. The entire document was provided to the Forest Ecosystem Management Assessment Team for use in developing various options for the FEMAT Report (Appendix A). The sections that are not reproduced in this appendix are those portions that have little bearing on the development of an overall strategy for managing late-successional and old-growth forests.

Following the analysis of public comments on the Draft Plans, resource specialists and managers revised the strategy set forth in the preferred alternatives. This revision was intended to be developed into the Proposed Resource Management Plans and Final Environmental Impact Statements for the western Oregon BLM Districts. This was originally expected to be published during the summer of 1993. Work was stopped on this project as a result of President Clinton’s directive to develop an interagency approach that would consider forest management within the range of the northern spotted owl. The reader should note that this portion of Appendix B reflects the developmental stage of the Revised Preferred Alternative at the time work was interrupted. The editing and revision that was anticipated did not take place. However, the text and accompanying maps show the management direction and land use allocations that were used by the Assessment Team and which are part of the various alternatives described in this SEIS.

Important revisions to the Draft Plans include:

- The change of connectivity design from a corridor concept to an island biogeography concept that uses islands of habitat to link large habitat areas, and to add richness and diversity to the General Forest Management Area (the matrix). These habitat islands, usually 600 acres or larger, are referred to as Connectivity/Diversity Blocks.
- The addition of Managed Pair Areas and Reserved Pair Areas as described in the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.).
- The adjustment of Old-Growth Emphasis Area (OGEA) boundaries to coincide with boundaries of Designated Conservation Areas (DCAs) in the Final Draft Spotted Owl Recovery Plan.

The BLM's District maps show land allocations and are included at the end of this section. The redesigned connectivity areas are shown along with combined categories of reserve or conservation areas. For a clear and full view of the land allocations and management guidelines these maps should be used in conjunction with the original maps and text published with the Draft RMP/EISs for western Oregon and the standards and guidelines contained in the Final Draft Spotted Owl Recovery Plan (see Appendix B5, Recovery Plan Standard and Guidelines). The relationship of the strategy used in the BLM Draft Plans to the alternatives in this SEIS is described in Chapter 2 of this document.

Subsequent to the public comment period for this SEIS, further revisions were made to the management direction to the Draft Plans. These changes are listed in Appendix B9, BLM Spotted Owl Standards and Guidelines. In addition, other changes and revisions are anticipated as the BLM completes the Proposed Resource Management Plans and Final Environmental Impact Statements for the western Oregon Districts, making them consistent with this SEIS.

Abbreviations used in Appendix B1:

ACEC	Area of Critical Environmental Concern
ASQ	Allowable Sale Quantity
BLM	Bureau of Land Management
BMP	Best Management Practice
CRMP	Coordinated Resource Management Plan
dbh	diameter breast height
DCA	Designated Conservation Area
DEQ	Department of Environmental Quality
GFMA	General Forest Management Area
HMP	Habitat Management Plan
INSOCG	Interagency Northern Spotted Owl Conservation Group
LWD	Large Woody Debris
MPA	Managed Pair Area
NSO	No Surface Occupancy
ODFW	Oregon Department of Fish and Wildlife
OGEA	Old-Growth Emphasis Area
ORV	Off-Road Vehicle
PRMP	Proposed Resource Management Plan
RMA	Riparian Management Area
RMP	Resource Management Plan
RPA	Reserved Pair Area
SMA	Special Management Area
TPCC	Timber Production Capability Classification
VRM	Visual Resource Management

Bureau of Land Management
Western Oregon Resource Management Plan
Revised Preferred Alternative

Introduction

Vision

The Bureau of Land Management (BLM) will manage the natural resources under its jurisdiction in western Oregon in a manner complementary to and in cooperation with other land owners, so that both the ecological condition of the natural environment and the social well-being will be maintained and enhanced.

The basic principles supporting this vision are that:

- it is possible to manage resources in a manner that harmoniously provides for human use and a healthy natural environment;

- stewardship, the intelligent involvement of people working with natural processes, will be essential for successful implementation;

- BLM cannot achieve the vision alone but can, by its management processes and through cooperation with others, be a significant catalyst for achievement;

- the focus must be ecological rather than on a single resource or species;

- a carefully designed program of monitoring, research and adaptation will be the change mechanism for this long term mission.

Strategy - Western Oregon and District Wide

Lands administered by the BLM can be managed to maintain healthy, functioning ecosystems while providing a sustainable production of natural resources. This management strategy (Ecosystem Based Management) is the careful and skillful use of ecological, economic, social, and managerial principles which ensure the sustained desired conditions of the whole. Ecosystem management is a strategy that emphasizes the whole, and the relationships within the ecosystem; instead of individual independent components. Ecosystem management looks at sustainable systems and products that people want and need. It is a balance between social acceptability, economic feasibility, and physical/biological possibility.

The building blocks for this strategy consist of four major land use allocations, which are designed to meet the overall vision of ecosystem based management of BLM-administered lands in western Oregon. These building blocks are arranged on the landscape to complement assumed management strategies of other landowners, while restoring or maintaining the diversity, abundance, and distribution of both plant communities and wildlife habitat to prevent species loss.

Objectives for the four major land use allocations are described below:

Old-Growth Emphasis Areas (OGEAs) would be managed to maintain, increase, or develop old-growth characteristics. They would be located where they would support regional biological diversity and would represent approximately 25 to 30 percent of BLM administered lands in western Oregon.

General Forest Management Areas (GFMAs) would be managed for forest production while providing for long term site productivity, forest health, cavity nester habitat, and biological legacies. A variety of seral stages would be represented. In the next few decades older forest seral stages would be retained but in the long term, the landscape in the GFMA would have a mosaic of even-aged stands (except southern GFMAs and the Klamath Falls Resource Area) ranging from young stands to stands 70 to 110 years old.

Connectivity/Diversity Blocks would be managed to provide movement, dispersal, connectivity opportunities and add to the richness and diversity of the landscape. Approximately 25 to 30 percent of these blocks would be retained in old-growth condition. Where old growth was not available, 25 to 30 percent of the oldest available forest would be retained. These areas would be located within the GFMA to complement larger old-growth areas such as OGEAs, Wilderness, and parks.

Special Management Areas (SMAs) would be managed to maintain the special values they represent such as riparian, research natural areas, recreation, or environmental education. They contribute to the overall strategy by providing a diversity of habitats throughout the landscape. Special Management Areas are scattered throughout the landscape and often overlap the other three land use allocations. These areas contribute to the overall strategy by providing a diversity of habitats throughout the landscape.

The specific objectives for these Special Management Areas are identified in the following resource by resource discussion.

Implementation

The resource management plan (RMP) establishes objectives and land use allocations at a relatively broad level. Under ecosystem based management, implementation is best accomplished at the landscape level. Landscape level management considers all resources and social and economic values at the same time when designing actions; looks at an entire landscape (watershed, subwatershed or other logical ecological landscape); considers all lands in landscape (ignore property lines); builds partnerships to facilitate and enhance landscape/ecosystem management; and where appropriate, consolidates and replaces individual resource specific activity plans with landscape level plans. These plans will be developed considering all components of the ecosystem, rather than the prior method of concentrating on one resource, such as a recreation area that only discussed recreation opportunities and not wildlife habitat projects.

A landscape is a heterogeneous area composed of a cluster of interacting ecosystems that are repeated in similar form throughout. For example, an area drained by a major stream, within a climatic regime, geomorphic processes, and natural vegetation patterns are fairly uniform. A landscape is larger than a stand and smaller than a region, and thus can vary greatly in size.

A key feature of landscape management is considering the landscape in relationship with the next larger and next smaller landscape. For example, when planning for a landscape consisting of a 6,000 acre subwatershed, one would also consider its relationship to the entire watershed as well as looking at how seral stages, stands, or plant communities are distributed within the subwatershed and next larger landscape. Regardless of the scale, the relationship of each resource with all other components of the ecosystem must be weighed. Social aspects were also regarded as an important aspect of prescribing management actions, and will continue to be important while implementing the plan.

In order to implement landscape level activities most efficiently, information on particular components (such as rare species and animals with a range of occurrence in more than one landscape unit) will be collected across the larger ecosystem. Ecosystem level strategies providing the "big picture" of the resource will need to be developed to provide flexibility and broad-based management of these components over the long term in the various landscape units where they occur across the ecosystem.

Actions proposed where landscape plans are not complete would consider landscape issues in order not to preclude options for landscape management. For example, the design of a timber sale would look beyond the stands proposed for harvest and consider its impact on the spatial patterns, seral diversity, etc., of the subwatershed or watershed that may be part of the landscape they are in. Ecosystem based management implies looking at our actions in terms of the various ecosystem scales, most importantly to consider the next larger scale in the landscape, looking at all the interacting pieces, not just one specific resource.

Adaptive Management

The management actions/direction are intended to be adaptive in nature and subject to changes from monitoring and/or research. An intensive monitoring program closely linked to established resource objectives and thresholds or a range of thresholds is a critical part of implementation. Monitoring results may lead to amendments of the Proposed Resource Management Plan (PRMP) or modifications to specific management directions. Adaptive management is critical to assuring the success of an ecosystem based management approach reflecting the complexity and variation found "out on the ground".

Adaptive management could entail modification of silvicultural prescriptions to respond to increasing knowledge providing greater certainty about anticipated climate change, or to respond to increasing knowledge about the habitat needs of northern spotted owls, to cite two examples that could have widespread application. It could equally entail modification of rather localized management practices to respond to the results of monitoring.

Another example of adaptive management would include changing or updating inventory information to reflect new information. For example, revisions or refinements to the Timber Production Capability Classification (TPCC) are ongoing. If these changes became significant, corresponding adjustments would be made in RMP decisions and/or outputs (expected allowable sale quantity [ASQ]).

Resource by Resource Discussion

The following discusses Objectives, Land Use Allocations, and Management Actions/Direction for the various resources, commodities, and programs. Although described separately, each contribute collectively and cumulatively to meeting the overall strategy of managing the bioregion and must be considered together to accurately reflect the concept of ecosystem based management.

In this document, an **objective** is the desired condition of a resource that the BLM will work toward using prescribed management actions and land use allocations. **Land Use Allocations** are the uses for an area that are allowed, limited, or excluded, as well as the terms and conditions of these uses. **Management actions/direction** are those specific actions that the BLM intends to take in order to achieve the objectives described for each resource or program. It is anticipated that as we implement the plan we may adapt these management actions/direction to assure that we meet the objectives.

Biological Diversity

Resource Condition Objectives

Restore or maintain the diversity of naturally occurring ecosystems, communities and native species in abundances and distributions which prevent the loss of native plant community types or indigenous plant or wildlife species habitat within the District.

Maintain representative examples of the full spectrum of ecosystems, biological communities, habitats and their ecological processes. Provide for the increase of the scientific understanding of biological diversity and conservation.

Protect, enhance and restore the plant community structure, species composition and ecological processes of special habitats to sustain healthy function.

Restore or maintain or old-growth forest areas to provide for those plant and animal species and processes associated with these habitats.

Establish a system of old-growth habitat islands (connectivity/diversity blocks) across the GFMA to provide for movement, dispersal, and connectivity of plant and animal species, and to maintain ecotypic richness and diversity in the forest matrix of the GFMA. These **connectivity/diversity blocks** would be arranged on the landscape in size and number to provide for the following:

- wide ranging animals can travel, migrate, meet mates
- genetic interchange can occur
- populations can move in response to environmental change and natural disasters.
- individuals can recolonize habitats from which populations have been locally extirpated.
- link physiographic regions, large habitat areas (ecological continents) i.e., OGEAs, Wilderness, Forest Service, Designated Conservation Areas (DCAs), etc.
- add or maintain richness and ecotypic diversity to the landscape
- allow for unknown species and processes (keep the pieces strategy).

Within the GFMA emphasis would be placed on use of intensive forest management practices and investments to maintain a high level of sustainable timber production while maintaining long-term site productivity, biological legacies, and a biologically diverse forest matrix.

Land Use Allocations

Manage **old-growth emphasis areas (OGEAs)** for old-growth forest conditions. These are located where they support regional biological diversity. These areas would also be managed to provide large blocks of habitat for spotted owls and are coincident with the DCAs in the *Final Draft Recovery Plan for the Northern Spotted Owl* [USDI unpub.].

Connectivity/diversity blocks would be established, usually about 640 acres in size, using a landscape strategy which incorporates the following considerations:

- value of the old-growth habitat island is related to the matrix or context within which it occurs; e.g., agricultural, industrial forest, residential, etc.
- structure or content of the island; e.g., forestable acres, existing age classes or condition, etc.
- complement the landscape pattern, make use of, strengthen, tie-in landscape features such as special areas, Visual Resource Management (VRM), special status species habitat, wild and scenic rivers, Riparian Management Areas (RMAs), TPCC, watershed, etc.
- areas that either presently lack or would lack under GFMA management landscape ecotypic diversity and richness
- strategic location for function and integrity; e.g., connectivity of OGEAs, DCAs, physiographic regions, etc.
- opportunity for travel corridors and connectivity e.g., riparian, VRM, TPCC, etc.

The strategy for establishing the **connectivity/diversity blocks** would incorporate the concepts of island biography. The number of islands would be an important consideration and the balanced against size. The large habitat islands or continents would be set in the OGEAs, Reserved Pair Areas (RPAs), Managed Pair Areas (MPAs), DCAs, Wilderness and other large reserves on BLM and Forest Service land. The biological diversity blocks would create habitat archipelagos and connect the large habitat islands. The biological diversity blocks would complement the large islands by creating a greater number of habitat islands with smaller inter-island distances which would provide greater connectivity and greatly increase the prospect for frequent colonization, movement, etc. The potential flora and fauna interaction between habitat areas would be increased.

The number of biological diversity blocks needed to create or maintain landscape richness and diversity would vary depending on the specific context or matrix of an area.

General Forest Management Areas would be managed for forest production while providing for long term site productivity, forest health, cavity nester habitat, and biological legacies. A variety of seral stages would be represented. In the next few decades older forest seral stages would be retained but in the long term, the landscape in the GFMA would have a mosaic of even-aged stands (except southern GFMAs and the Klamath Falls Resource Area) ranging from young stands to stands 70 to 110 years old.

Special Management Areas would be managed to maintain the special values they represent such as riparian, Areas of Critical Environmental Concern (ACECs), research natural areas, recreation,

marbled murrelet sites, fragile sites, or problem reforestation sites. They contribute to the overall strategy by providing a diversity of habitats throughout the landscape. Special Management Areas are scattered throughout the landscape and often overlap the other three land use allocations. These areas contribute to the overall strategy by providing a diversity of habitats throughout the landscape.

Special habitats (forested or nonforested) which are distinct from the general forest matrix such as ponds, bogs, springs, seeps, marshes, swamps, prairies, meadows, oak woodlands, dunes, balds, cliffs, caves, talus slopes, rock outcrops, serpentine barrens, bluffs, caves, salt licks, and mineral springs would be maintained in a natural condition in the same abundance and distribution across the landscape. Protect and maintain species composition, ecotones and ecological processes of these habitats to sustain a healthy ecosystem and contribute to maintenance of biological diversity. Special habitats occur across all land use allocations.

Management Actions/Direction

Old-Growth Emphasis Areas

Existing old-growth forests and spotted owl habitat would be maintained. Stands would be managed to accelerate the development of old-growth forest conditions and spotted owl habitat.

Management activities would include young stand maintenance and management and density management thinning to speed up or enhance old-growth habitat. Density management harvests would be limited to 10 percent of any OGEA per decade. Regeneration harvest would be deferred for 80 years. After 80 years, regeneration harvesting would be limited to systems designed to reestablish ecological old-growth conditions or to maintain those conditions.

Prescribed fire and density management would be used where appropriate to maintain or restore ecological processes and forest health, or prevent appreciable loss of habitat. In some cases there are significant threats to habitat maintenance posed by forest health factors, such as unnaturally dense stands or understories resulting from fire suppression. In these situations, departures from the established management direction could be allowed from the established management direction in order to preclude the loss of spotted owl habitat or old-growth forest stands. Proposals for such departures would be contingent upon concurrence by the Interagency Northern Spotted Owl Conservation Group (INSOCG).

Management activities would maintain or improve the present function of spotted owl habitat (e.g., nesting roosting, foraging, or dispersal). In addition, activities would not retard the development of suitable habitat or old-growth characteristics. In addition, no activities would be allowed within 1/4 mile of active spotted owl nesting centers of activity and no density management would occur within 1/4 mile.

Activity plans would be developed for the OGEAs to direct site-specific management activities. These plans would include an assessment of wildfire potential, role of prescribed fire, and road management. Unless these plans direct otherwise, intensive fire suppression strategies would be used when controlling wildfire and new road construction would be minimized to that necessary for thinning. Only arterial and major collector roads would remain open to the public in these areas.

Connectivity/Diversity Blocks - The connectivity/diversity blocks would be managed to maintain a minimum of 25 to 30 percent old-growth condition both long term and short term where it exists. The

percentage of old-growth habitat may be measured at a sub-watershed or compartment level that consists of logical groups of connectivity diversity blocks. The percentage of habitat could include existing SMAs. The size and arrangement of habitat within the block should provide as effective habitat as possible.

The silvicultural retention system used would be designed to recreate forest ecosystems that closely resemble natural old-growth systems in composition, structure, and function. Retained structural components would include live trees, snag, and large down woody material. These would be distributed in various ways in the stand on the landscape. Hardwoods would be retained or restored in stands at a level consistent with the identified target stand. The silviculture retention system would mimic a moderately heavy large scale natural disturbance event which results in the initiation of a new stand cohort. The regeneration harvest would resemble a shelterwood cut with trees scattered irregularly and/or grouped. Retained trees would represent a range of species, vigor and condition.

The connectivity/diversity blocks would be managed with 12 to 18 green conifers retained per acre at regeneration harvest. The silvicultural goal of the retention trees and subsequent density management would be the recovery of old-growth conditions in approximately 100 to 120 years. Following wildfires or other large disturbances, salvage logging would be allowed, leaving at least 4 snags per acre, all remaining green trees and at least 4 tons of coarse woody debris. Stands under 150 years old, and smaller, more fragmented stands, would have a higher priority for harvest than older, more intact stands.

General Forest Management Areas

Emphasis would be placed on the use of intensive forest management practices and investments to maintain a high level of sustainable timber production while maintaining long-term site productivity, biological legacies, and a biologically diverse forest matrix.

Regeneration harvest units would retain a minimum of 6-8 green conifers per acre, along with snags, coarse woody debris, and hardwoods to provide a biologically diverse stand.

Retain Port-Orford-cedar to identify genetically transmitted resistance mechanisms and for its contribution to biological diversity. Proactively manage to limit the spread of Phytophthora Lateralis and reduce the number of infected areas.

Manage **Pacific yew** consistent with Forest Service/BLM strategy. This strategy includes assuring a sustainable supply of taxol while maintaining the presence and function of Pacific yew in the ecosystem.

Special Habitats

Generally a 100-200 foot buffer would be maintained but this could be increased, decreased or manipulated based on site specific circumstances and the objective to protect the special habitat values. Ecologically significant buffers would be determined by interdisciplinary teams comprised of all program specialists.

Use silvicultural prescriptions and fire management to manage special habitats such as oak woodlands, prairies, meadows, marshes and grassy balds to prevent the encroachment of dense underbrush, shade-tolerant conifers and other species not naturally found in these plant communities under more natural fire conditions.

New roads and other rights-of-way (pipelines, powerlines, etc.) would avoid special habitats which contain components or are themselves not represented adequately within the landscape to maintain biological diversity. Where new roads or other rights-of-way affect special habitats, they would be located to minimize effects to these habitats where physically possible.

Water, Soil, Riparian, and Wetland Resources

Objectives

Manage water resources in compliance with legal requirements to protect, maintain, or improve the quality of water resources and watershed values associated with BLM-administered land, including surface and ground water quality and quantity.

Meet or exceed State water quality standards and protect designated beneficial uses.

Maintain or improve the biological, chemical, and physical functions of the stream ecosystem.
Manage riparian zones to maintain or improve riparian conditions that support water-related functions (e.g., streambank stability, physical filtering of water, source of coarse woody debris to dissipate flood energy and create aquatic habitat, water storage, aquifer recharge, carrying and storing flood flows, and insulating streams from summer and winter temperature extremes).

Manage riparian zones and wetlands in accordance with the BLM Riparian-Wetlands Initiative for the 1990's. Management would emphasize: protection of riparian-wetland areas and associated uplands; rehabilitation and maintenance of riparian-wetland areas; and partnership and cooperative rehabilitation and management of riparian-wetland areas.

Maintain or improve riparian habitat for wildlife and native plant diversity.

Protect wetlands in accordance with Executive Order 11990 to minimize destruction, modification, loss or degradation and to preserve and enhance their beneficial values.

Protect floodplains in accordance with Executive Order 11988 to restore and preserve their natural and beneficial values.

Manage watersheds providing surface water used by community water systems to comply with the Clean Water Act.

Manage uplands to minimize nonpoint source pollution and moderate extremes in streamflow by maintaining or improving hydrologic functions (e.g., infiltration, instream flow, ground water quantity, etc.).

Protect long-term soil productivity by minimizing erosion, including landslides, and maintaining beneficial physical and chemical properties of soils.

Stream/Riparian Management Area Condition Objectives by Stream Order and Type

The following stream condition objectives apply specifically to the GFMA and Connectivity/Diversity Blocks. Higher levels of protection will be provided in OGEAs and Special Management Areas.

- Nonfish-Bearing; Intermittent; Order 1

Stable stream channel and banks.
Adequate vegetation to minimize entry of nonpoint source pollution (e.g., sediment) from upslope activities into stream channel.
Adequate stream structure to minimize sediment movement downstream.
Adequate shade to prevent evaporation of subsurface moisture in stream channel.
50 percent of natural large woody debris (LWD) input.
Low to Moderate level of aquatic habitat.
Marginal habitat conditions along hardwood and shrub buffers for terrestrial amphibians and small mammals.

- Nonfish-Bearing; Intermittent; Order 2

Stable stream channel and banks.
Adequate vegetation to minimize or prevent entry of nonpoint source pollution (e.g., sediment) from upslope activities into stream channel.
Adequate stream structure to minimize sediment movement downstream.
Adequate shade to prevent evaporation of subsurface moisture in stream channel.
70 percent of optimum large woody debris input.
Moderate level of aquatic habitat.
Marginal habitat conditions along hardwood and shrub buffers for terrestrial amphibians and small mammals.

- Nonfish-Bearing; Perennial; Order 1 and 2

Stable stream channel and banks.
Adequate vegetation to prevent entry of nonpoint source pollution (e.g., sediment) from upslope activities into stream channel.
Adequate stream structure to minimize sediment movement downstream.
95-100 percent of optimum stream shading to maintain or reduce summer maximum water temperatures.
80 percent of optimum large woody debris input.
Moderate level of aquatic habitat.
Limited amounts of suitable habitat for terrestrial amphibians and small mammals.
Low level of large mammal travel zones.

- Nonfish-Bearing; Intermittent or Perennial; Order 3

Stable stream channel and banks.
Adequate vegetation to prevent entry of nonpoint source pollution (e.g., sediment) from upslope activities into stream channel.
Adequate stream structure to minimize sediment movement downstream.
95-100 percent of optimum stream shading to maintain or reduce summer maximum water temperatures.
90 percent of optimum large woody debris input.
High level of aquatic habitat.
Limited amounts of suitable habitat for terrestrial amphibians and small mammals.
Low level of large mammal travel zones.

- Fish-Bearing; Intermittent or Perennial; Order 1, 2, and 3

Stable stream channel and banks.
Adequate vegetation to prevent entry of nonpoint source pollution (e.g., sediment) from upslope activities into stream channel.
Adequate stream structure to minimize sediment movement downstream.
95-100 percent of optimum stream shading to maintain or reduce summer maximum water temperatures.
100 percent of optimum large woody debris input.
High level of aquatic habitat.
High level of fish habitat.
Limited amounts of suitable habitat for terrestrial amphibians and small mammals.
High level of large mammal travel zones.
High level of nesting for riparian associated water birds and raptors.

- Fish or Nonfish-Bearing; Intermittent or Perennial; Order 4+

Stable stream channel and banks.
Adequate vegetation to prevent entry of nonpoint source pollution (e.g., sediment) from upslope activities into stream channel.
Adequate stream structure to minimize sediment movement downstream.
95-100 percent of optimum stream shading to maintain or reduce summer maximum water temperatures.
100 percent of optimum large woody debris input.
High level of aquatic habitat.
High level of fish habitat.
Adequate amounts of suitable habitat for terrestrial amphibians and small mammals.
High level of large mammal travel zones.
High level of nesting for riparian associated water birds and raptors.

[**Insert PLACEHOLDER Table B1-1.** ONE THIRD PAGE]

Land Use Allocations

Riparian Management Areas - Riparian Management Areas will be established on all streams, lakes, and ponds to meet water and riparian objectives. RMA widths will be prescribed to fit on-the-ground stream characteristics. Design of RMA prescriptions will consider overall watershed and riparian condition, occurrence of sensitive species, and designation of a water quality limited stream. Specific elements to be considered when determining RMA widths and prescriptions would include:

- Amount of roads in watershed
- Age and condition of forest stands in watershed
- Amount of watershed withdrawn from disturbance
- Topography of watershed and immediate area (i.e., side slope)
- Current condition of aquatic and riparian habitat in watershed
- Distance to fish habitat if affected stream does not support fish
- Class of stream (i.e., fish-bearing, nonfish-bearing, water quality)
- Width of flood plain
- Width of riparian zone
- Plant community in both riparian and adjacent upland areas
- Stand characteristics of conifers in both riparian and adjacent upland areas
- Amount and type of understory vegetation in riparian zone
- Soil types in both riparian and adjacent upland areas
- Channel type (i.e., constrained, unconstrained, bed rock controlled, alluvial controlled etc.)
- Stream size and order
- Stream gradient
- Windthrow risk
- Stream channel condition upstream and downstream from project area

[Insert PLACEHOLDER Table B1-2. THIRD PAGE]

Expected average RMA widths (on each side of stream) are displayed in Table B1-2.

Minimum RMA widths on each side of fish-bearing streams (generally third order and larger streams) or adjacent to lakes and ponds will be the larger of the following three widths: the riparian zone, the floodplain, or 100-feet horizontal distance from the high water mark. Average RMA widths will be wider and vary by stream order.

Timber Production Capability Classification - As part of the inventory of lands suitable and capable of being managed for timber production, landslide prone soils, and other unstable soils were identified as not suitable, in part to protect watersheds. Other surface-disturbing activities will be prohibited unless adequately mitigated to protect water quality.

Management Actions/Direction

The RMAs along all streams, lakes, and ponds will be managed to meet the water and riparian objectives. Within RMAs along fish-bearing, perennial, or third order and larger streams, lakes and ponds, limited management activities could occur to achieve resource management objectives such as stream/riparian enhancement, enhancement of fish and wildlife habitat, yarding corridors to facilitate timber harvest outside the RMA, and road crossings. Prescribed fire and silvicultural activities could be used to meet RMA management objectives. Snags and down logs will be retained as identified in Chapter 2, Wildlife [of the BLM Draft RMPs].

For RMAs along first and second order, nonfish-bearing, intermittent streams, management activities such as stream/riparian enhancement, timber harvest, road crossings, prescribed fire, planting, and precommercial thinning could occur if designed to meet the water and riparian objectives. Management of these RMAs will emphasize leaving brush, hardwoods, Pacific yew, and nonmerchantable and noncommercial vegetation to achieve objectives, however, it is expected that some conifer retention will also be necessary to meet objectives.

Protection for wetlands could include buffering, not entering, or other measures as needed based on site-specific conditions.

Springs will be managed as special habitat (see Wildlife section [of the BLM Draft RMPs]).

Management activities will comply with Oregon’s Regulations Relating to Water Quality Control (Oregon Administrative Rules 340-41), including the Antidegradation Policy. The purpose of the Antidegradation Policy, which includes policies on high quality waters, water quality limited waters, and outstanding resource waters, is to protect, maintain, and enhance existing surface water quality to protect all existing beneficial uses.

Management actions will be consistent with Oregon water quality management programs for designated water quality limited streams.

Management activities will be consistent with Oregon’s Nonpoint Source Statewide Management Program. A nonpoint source management program will continue to be implemented in cooperation with the U.S. Environmental Protection Agency and the Oregon Department of Environmental Quality (DEQ) to assure protection of water and water-dependent resources. Oregon’s nonpoint source management program requires BLM to implement best management practices (BMPs) which

protect the beneficial uses of water. BMPs will be selected based on site-specific conditions, technical and economic feasibility, and the water quality regulations for waters potentially affected. Timber harvesting, minerals management, recreation, off-road vehicle (ORV) use, and other surface-disturbing activities will be managed to protect water quality.

Watershed and stream enhancement activities such as reducing soil compaction, vegetating disturbed areas, and stabilizing streambanks will be conducted to achieve water and soil resource objectives.

Chemical uses by BLM, authorized contractors, and mining operators will provide for protection of both surface water and ground water. Examples of chemicals used could include, but are not limited to, herbicides, pesticides, fertilizers, fire retardant, solvents at maintenance shops, and fuels and chemicals used in mining operations. Herbicides will not be applied within 500 feet of any residence or other place of human occupancy without the occupant's consent or within 100 feet of any cropland.

Herbicides will not be applied by helicopter within 100 feet of any surface waters, by ground vehicles with boom sprayers within 25 feet of surface water, or by vehicle-mounted handguns or with backpacks within 10 feet of surface water.

Analysis of cumulative effects will help guide overall project scheduling during the life of the plan.

Land exchanges or acquisitions could be used to block up BLM management within watersheds or to obtain key riparian-wetland areas.

Fish Habitat

Objectives

Maintain or enhance the fisheries potential of fish streams and other waters consistent with BLM's nationwide Fish and Wildlife 2000 plan.

Promote recovery of depressed fish stocks.

See the Water, Soil, Riparian, and Wetland section for condition objectives by stream type. They also apply to fish habitat.

Land Use Allocations

See Land Use allocations and Management Direction for Water, Soil, Riparian, and Wetland Resources.

Management Actions/Direction

See Land Use allocations and Management Direction for Water, Soil, Riparian, and Wetland Resources.

A regional plan for coastal Oregon, Washington, and California will be created. This plan will serve to update the BLM's current anadromous fish management plan and will provide much increased emphasis on watershed-level planning and analysis. In the interim, to the extent of available funding,

implementation of BLM's "A Five-Year Comprehensive Anadromous Fish Habitat Enhancement Plan for Oregon Coastal Rivers, 1985" will continue. Projects would be implemented only when they are compatible with Oregon Department of Fish and Wildlife (ODFW) wild fish management policy. Priority would be given to watersheds supporting "at risk" fish stocks. Rehabilitation efforts could also focus on streams that have been devastated by natural catastrophic events.

To protect investments in fish improvement projects, mineral withdrawal would be pursued for the affected stream reach.

In fish-producing streams, screening facilities would be required on intakes when granting rights-of-way or easements for water diversions (pipelines and ditches) across public land. Facility design would meet or exceed ODFW standards.

Except for land tenure zone 3 lands, riparian and fish habitat would be retained unless land exchanges would improve management of fish, wildlife, or riparian habitat elsewhere.

BLM would work with Oregon Department of Fish and Wildlife to determine appropriate streamflows for in-stream water rights (Oregon revised statute 537.336 to 537.348) in order to maintain or enhance aquatic habitat, particularly for special status species.

Special Status Species Habitat

Special status species include species which are federal listed, federal proposed, federal candidate, state listed, Bureau-sensitive, and assessment species.

Objectives

Protect, manage and conserve federal listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act and Bureau Special Status Species policies.

Manage for the conservation of federal candidate, and Bureau sensitive species and their habitats so as not to contribute to the need to list and to recover the species.

Manage for the conservation of state listed species and their habitats to assist the state in achieving their management objectives.

Maintain or restore plant community structure, species composition, and ecological processes of special status plant and animal habitat.

Protect and manage assessment species where possible so as to not increase their status.
Manage federal listed species to achieve their recovery.

The objectives for special status species apply to all land use allocations (OGEAs, Connectivity - Diversity blocks, GFMAs etc.). Acres of special status species habitat designated on the District will change throughout the life of the plan as inventories are conducted and the status of species change.

Land acquisitions would be pursued where needed to assure survival or recovery of federal listed, proposed, or candidate species.

Land Use Allocations

See discussion under each species, following.

Many Special Habitats and Special Areas (see also Biological Diversity and Special Areas sections of the RMP) are designated in the RMP for conservation of special status plant or animal habitats.

Management Actions/Direction

General management actions/direction for special status species habitat are followed by management actions/direction specific to individual species or special habitats.

General

Management actions pertaining to all special status plant and animal species and their habitats in general are presented immediately below and are followed by management actions which are specific to particular plant and animal species or habitats.

In all land use activities and under all land allocations avoid, protect or mitigate for all special status species populations and habitat so as to not contribute to the need to list the nonfederal listed species and to promote recovery of federal listed species. A variety of mitigation measures are possible and vary according to the specific situation.

All proposed actions will be reviewed for special status species and field surveys will be conducted during the proper season when necessary for agency controlled actions. Field surveys may not be conducted in all cases depending on the number and timing of previous surveys conducted in the proposed action area and the amount or likelihood of potential habitat present. The intensity of field surveys will also vary depending on the same factors.

If a proposed action is determined to affect any federal listed, federal proposed, federal candidate, state listed, or Bureau sensitive species or any of their critical or essential habitat, efforts would be made to modify, relocate, or abandon the project to avoid affecting the species or its habitat. When BLM determines that a management action that could adversely affect a federal listed, federal proposed or federal candidate species can not be altered and should not be abandoned, then consultation or technical assistance with the U.S. Fish and Wildlife Service or National Marine Fisheries Service will be initiated.

We will coordinate with the U.S. Fish and Wildlife Service and National Marine Fisheries Service in compliance with the Endangered Species Act and jointly endeavor to recover the listed and candidate plant and animal species, their habitats and ecosystems.

We will coordinate and cooperate with the State of Oregon whenever necessary to assist the BLM in achieving conservation of state listed species.

The distribution, abundance, reasons for current status, and habitat needs will be determined for federal candidate and Bureau sensitive species occurring on BLM administered land and the significance of BLM administered land or actions in maintaining those species will be evaluated. For

those federal candidate or Bureau sensitive species where BLM administered land or actions have a significant effect on their status, rangewide or site specific management plans will be developed and implemented and will include specific habitat and population habitat objectives designed for recovery.

All habitat essential for the survival of federal and state listed, federal candidate and Bureau sensitive species will be retained in federal ownership. Where appropriate opportunities exist, land acquisitions through exchange, purchase or donation would be pursued where it would contribute to recovery, reduce the need to list by providing protection, block up ownership, or enhance special status species habitat. Specific opportunities and needs would be identified in site-specific management plans.

Consistent with other plan decisions, Bureau assessment species will be protected so as not to increase their status. They will be included in all field inventory and clearance work and all new locations will be documented. Assessment species will be considered in all environmental analyses where impacts, if any, will be clearly identified for the population and the species as a whole. As funding permits and as species conservation dictates, active management for assessment species may be undertaken to assure survival of these species in Oregon. Prior to any vegetative manipulation, surface disturbing activity, or any disposal of BLM administered land, a review of the affected site or areas will be conducted for special status plant and animal species. If a proposed action is determined to affect any federal listed, federal proposed, federal candidate, state listed, or Bureau sensitive species or any critical or essential habitat, efforts would be made to modify, relocate, or abandon the project to avoid adversely affecting the species or its habitat. When BLM determines that a management action that could adversely affect a federal listed, federal proposed or federal candidate species can not be altered and should not be abandoned, then consultation with the U.S. Fish and Wildlife Service will be initiated. Correspondence with the state will be conducted whenever necessary to assist the state in achieving their objectives for state listed species.

Habitat (Plant or Wildlife) or Species Specific:

Northern Spotted Owl (Federal Threatened Species)

Objectives: Promote recovery, protect existing owls.

Management Actions/Direction:

Residual habitat areas of about 100 acres in size of nesting, roosting, and foraging habitat would be protected around the known activity centers for owl pairs or territorial singles. The intent is to protect the core areas in the short term and to provide potential nest sites in the long term except for those sites that exceed the target number per township identified in the recovery plan. All habitat is reserved for an expected 80 years.

Reserved Pair Areas would be protected to supplement DCAs until they become fully functional by maintaining additional suitable habitat and activity centers outside of OGEAs. These reserved pair areas consist of the area surrounding the activity center of a pair or resident single owl at least equal to the median home range size of pairs in the province. All habitat is reserved from harvest for an expected 80 years.

Managed Pair Areas managed (and available for harvest) so long as the median amount of suitable habitat in home ranges of observed pairs in the province is maintained. All habitat would be reserved for 10 years.

There would be no tree falling within one-quarter mile of all active northern spotted owl nest sites from approximately March 1 to September 30 to avoid disturbance and harm to young owls.

Human activities which could disturb owl nesting, especially use of large power equipment, would be prohibited within one-quarter mile of all active spotted owl nest sites from approximately March 1 to September 30. Nest located next to roads or other areas of human disturbance would not usually result in restrictions.

Marbled Murrelet (Proposed Federal Threatened Species)

Objectives: Will be added.
Management Actions/Direction:

Inventories and monitoring for this species would be instituted.

Any nest locations and occupied habitat areas would be protected. Human disturbance around these sites/stands would be minimized between approximately March 1 and July 15.

Bradshaw's lomatium (*Lomatium bradshawii*) (Federal and State Endangered)

[The following is an example.]

Objectives: Will be added.
Management Actions/Direction:

A Recovery Plan for Bradshaw's lomatium has not yet been released by the U.S. Fish and Wildlife Service. Interim management of the species will include:

- Identification of Bradshaw's lomatium as a special value in and continue the designation of Long Tom ACEC which is its only present habitat on BLM administered land;
- Prescribed fire for habitat enhancement and maintenance
- Monitoring of the effects of prescribed fire on control of the invading species and of its affect on the species;
- Studies and monitoring of population dynamics, hydrological and soil characteristics required by the plant in its native prairie habitat
- Coordination with U.S. Fish and Wildlife Service, The State of Oregon, the U.S. Army Corps of Engineers and The Nature Conservancy in management of the species across the landscape;
- Pursuit of opportunities for education about conservation of Bradshaw's lomatium;
- Pursuit of opportunities to increase the number of populations of Bradshaw's lomatium under BLM management through acquisition and reintroduction.

When the Recovery Plan is issued, BLM will implement management actions identified for BLM. As needed, we will continue to implement interim management actions identified above. If the Recovery Plan and this RMP are not adequate to cover objectives and actions relative to this species, a management plan will be developed.

As we gain new knowledge about the species requirements and threats we will conduct other activities needed to implement the Recovery Plan.

Bald Eagle (Federal Threatened Species)

Objectives: Will be added.
Management Actions/Direction:

All actions would be consistent with the Pacific Bald Eagle Recovery Plan. Known habitat sites and potential sites identified in the Recovery or Implementation Plans would be protected.

Peregrine Falcon (Federal Endangered Species)

Objectives: Will be added.
Management Actions/Direction:

All actions would be consistent with the Peregrine Falcon Recovery Plan. Known habitat sites and potential sites identified in the Recovery or Implementation Plans would be protected.

Within one mile of active peregrine falcon nest sites, human disturbances with the potential to disturb the nest would be minimized and roads (except major arterial roads) would be closed between February 1 and August 15. The areas would be managed to retain diversity of habitats for prey species. They would be designated fire fuels management areas to reduce fuel loadings and manage habitat conditions. As opportunities exist, forage for prey species could be enhanced through plantings of mast and berry-producing shrubs. All BLM-administered land would be retained in federal ownership. A Habitat Management Plan would be prepared to provide more specific management guidelines for peregrine falcons.

The core area within one-half mile of active peregrine nest sites would receive additional protection. In addition to the measures used in the one-mile radius within the protected core area, there would be no scheduled timber harvest, no aerial application of herbicides or pesticides, and no surface occupancy (NSO) for leasable minerals. There would be no new road construction unless the activity would not adversely effect the integrity of the site. These areas would be designated priority fire suppression areas.

Potential nest cliffs would be managed to provide for future population expansion. The cliffs themselves would be protected and enhanced if necessary. No new road construction would be permitted within one-half mile of these potential nest sites unless the activity would not adversely affect the integrity of the site, and there would be no surface occupancy for leasable minerals. These potential nest sites would be retained under BLM administration.

Townsend Big Eared Bat

Objectives: Will be added.
Management Actions/Direction:

Dense forest conditions would be retained if present or restored where possible around known colony caves. No new road construction would be permitted and human disturbance would be minimized. Seasonal recreational use of these caves could be permitted if it would not interfere with the bats. No surface occupancy would be allowed for leasable minerals. All BLM-administered land would be retained in federal ownership. Caves and mine adits would be inventoried for bats.

Siskiyou Salamander and Del Norte Salamander (Federal Candidate Species)

Objectives: Will be added.
Management Actions/Direction - Surface-disturbing activities would be avoided where feasible within 100 feet of talus habitat where the species is found. Habitat (talus areas) where the species is found would be protected in order to provide shady, humid micro-habitat. Potential habitat would be inventoried for these species.

Special Status Fish (species will vary by District, Medford example follows)

Jenny Creek Sucker (Federal Candidate Species), Redband Trout (Federal Candidate Species), Coho Salmon (assessment species, Rogue River basin), Summer Steelhead, (American Fisheries Society, proposed threatened species, Rogue River basin), and Winter Steelhead (American Fisheries Society, proposed threatened species, Illinois River basin).

Objectives: Will be added.

Management Actions/Direction - Timber harvest and other surface-disturbing activities would be prohibited within steep canyon areas along Jenny Creek and tributaries.

Surface-disturbing activities would be designed so they do not degrade habitat for the species listed above.

Wildlife Habitat

(will vary by District, Medford example follows).

The overall objective for managing wildlife habitat is to maintain healthy wildlife populations to contribute to biological diversity and ecosystem health.

Cavity dwellers and other snag associated species:

Objectives: Will be added.
Management Actions/Direction - In the General Forest Management Area the following would apply:

Snags, live cull trees, and green merchantable trees would be retained to provide an average of approximately 60 percent of the optimum, primary-excavator population habitat needs. This generally corresponds to 180 snags greater than 16 inches diameter breast height (dbh) per 100 acres of forested habitat.

All unmerchantable snags and culls would be retained unless they pose a safety hazard.

Within OGEAs, the following would apply:

Snags, live cull trees, and green merchantable trees would be retained to provide at a minimum the mean number of snags found in each seral stage of unentered stands, plus one standard deviation. This generally corresponds to 350 snags greater than 16 inches dbh per 100 acres of forested habitat.

Coarse woody debris would be retained to provide an average of approximately 60 percent of the mean amounts of down logs found in each seral stage of unentered stands. This generally corresponds to approximately 1,400 tons per 100 acres, with at least 1,300 pieces greater than 16 inches diameter and 12 feet long.

Raptors, Owls, and Great Blue Herons

Objectives: Will be added.
Management Actions/Direction - Nest sites, centers of activity, or rookeries would be protected as necessary to maintain the integrity of the site. Human disturbances which may disturb or interfere with nesting would be prohibited within one-quarter mile of active nesting areas between approximately March 1 and July 15.

Nesting platforms, nest boxes, and other structures would be erected to enhance habitat for osprey, other raptors, waterfowl, and other species as opportunities become available.

Roosevelt Elk

Objectives - Elk management areas would be managed to enhance elk habitat consistent with the other allocations (timber, old growth, connectivity) for these lands as identified below.

Management Actions/Direction - HMPs would be developed.

All roads except major collectors and arterial would be closed. New road construction would be minimized.

Roads would be managed through use of gates and other types of road barricades to limit motorized vehicle use to an open road density of 1.5 miles per square mile, where possible.

Seasonal restrictions on activities could be imposed if needed to avoid disturbance and harassment.

Forage habitat would be maintained or enhanced where appropriate by creating small openings in conifer stands of all ages, broadcast burning, seeding, fertilizing, underburning forest stands, or other means.

The mix of forage areas, thermal cover, hiding cover, and optimal cover would be managed to maintain or attain highly viable habitat condition for each of the four indices using the Wisdom Elk Model or equivalent model.

Deer and Elk Winter Range

Objectives - Deer and elk winter range in the Cascade foothills would be managed as winter range with an emphasis on providing thermal cover and minimizing disturbances .
Management Actions/Direction:

HMPs or coordinated resource management plans (CRMPs) would be developed for the big game management areas.

All roads, except major collectors and arterial, would be closed between November 15 and April 1. New road construction would be minimized.

At least 20 percent of these areas would be maintained in thermal cover, 70 percent canopy closure, canopy height of at least 40 feet, and large enough to avoid edge effects. Management activities would be allowed in these areas consistent with the objectives for maintaining thermal cover and minimizing disturbance.

Seasonal restrictions would be applied to activities to avoid disturbance between approximately November 15 and April 1.

Where elk management areas overlap with winter range areas, management directions for both areas would be applied.

Golden Eagles

Objectives:

Management Actions/Direction - Approximately 30 acres would be protected around all known golden eagle nest sites. Within those areas there would be no timber harvest or other habitat removal. Human disturbance would be prohibited between approximately March 1 and July 15. No new roads would be constructed within the 30-acre core area around active nests.

Timber Products

Objectives

Timber management activities would be planned and designed to produce a sustained flow of forest products in order to contribute to long term stability for dependent communities and local industries. A diversity of forest products (timber and nontimber) would be offered in order to support both large and small commercial operations as well as noncommercial operations.

All silvicultural systems would be sustainable, economically practical, and capable of maintaining the long-term health and productivity of the forest ecosystem.

Forest management practices would be designed to retain long-term site productivity, promote ecosystem health, and assure the sustainability of timber production.

Silvicultural treatments and harvest schedules would be designed to assure that wood quality is suitable for the range of current and forecast uses and that maintenance or enhancement of log value is an objective of silvicultural treatments.

Land Use Allocations

Suitable commercial forest land that would be available for timber management includes land in both the General Forest Management Areas, and Connectivity/Diversity Blocks. In addition, suitable

commercial forest land in OGEAs would be available for density management in the next decade and would be available for regeneration harvests pending deferral for eight decades.

Economically Marginal Lands: Lands determined to be economically marginal are not included in the timber allocation. Timber harvest could occur from those lands when changed economic conditions made them economical and where consistent with land use allocations.

Woodlands: Timber harvest from woodlands is not planned (or included in ASQ estimates) but could occur to carry out management actions designed to achieve nontimber resource objectives as part of research or to salvage mortality. Any harvest would be consistent with other land use allocations and objectives.

Site Class V Lands: Site Class V lands would be managed at a lower level of intensity because of economic considerations and uncertainty about the effect of intensive management on poor sites.

Hardwood Stands: (Medford example) Hardwood stands would be managed for production of commodities as markets became available, but regeneration with the same hardwood species mix would follow harvest. Up to one two-hundredths of the total hardwood allocation area could be harvested per year.

White oak woodlands would be managed to meet wildlife, range, and biological diversity objectives.

Enhancement of Other Resources: Lands unavailable for planned forest management include: woodlands, recreation sites, RMAs, ACECs, wild rivers corridors, and habitat for threatened and endangered and special status species including the northern spotted owl. Timber harvest would occur only as part of strategies to enhance other resources such as riparian habitat, wildlife habitat, or management of special areas. Harvest from these lands, would generally not be included in the planned ASQ.

The following lists some of the reasons that timber harvest could occur on these lands.

-Provide more logical logging units or reduce road construction, thereby reducing overall cumulative effects.

-Salvage timber killed or substantially damaged by fire, wind throw, insect infestation, or other catastrophe. Such harvest would be accomplished under special silvicultural prescriptions designed to meet the needs of nontimber allocations made on these lands.

-Provide for the safety of forest users (including removing hazard trees along roads and trails, in campgrounds and administrative sites, etc.).

-Facilitate construction, operation, and maintenance of new facilities such as roads, trails, power lines, communication facilities, recreation or administrative facilities, etc.

- Scientific or research studies.

- Isolate and release Douglas-fir and sugar pine test trees.

- Maintain or enhance fish and wildlife habitats.

- Facilitate development of mines, quarries, or fluid mineral leases.

-Modify high fuel hazard areas by construction of shaded fuel breaks and/or increase defensible space for fire suppression by maintenance of early seral stage conditions. Such activity could occur to provide protection for timber production areas, old-growth blocks, or developed recreational facilities.

Management Actions/Direction

Vegetation management treatments would be based on attainment of allocation objectives including timber production, maintenance of wildlife habitat, and maintenance of species diversity. Herbicides could be utilized in accordance with the anticipated BLM Management of Competing Vegetation Record of Decision, but preference would be given to strategies which redirected natural ecosystem processes where practical and where scientific knowledge was adequate to support such strategies. After a transition period to complete needed stand maintenance on clearcuts created by past management, aerial application of herbicides would decline to a negligible level.

To minimize the regeneration period, artificial regeneration would be used to supplement natural reforestation. Planting would occur at minimum needed densities using a mix of native species (generally based on the percentage of species existing in the stand) to help assure species diversity.

Forest fertilization would be used with preference given to fertilization of young even-aged stands of site four and higher in the next decade.

Practices that enhance timber quality, including pruning, would be used.

Water quality and site productivity: Best Management Practices for soil and water resources would be used in designing site-specific silvicultural prescriptions consistent with the objectives of each plan alternative.

Salvage of mortality: Salvage of partial or entire stand mortality would occur where consistent with land use allocations, as well as snag and down wood retention objectives for soils and wildlife (see Wildlife section).

Species and stocking levels: The density and species mixture of commercial forest stands would be consistent with the design and theme of each alternative. Both precommercial and commercial thinning would be scheduled to achieve desired levels of timber production, to maintain stand vigor, and to achieve desired stand characteristics.

Reforestation practices: All stands subject to regeneration harvest would be promptly reforested using seeding, planting, or natural reforestation techniques. Emphasis would be placed on the use of practices which were based on an understanding of and maintenance of natural ecological relationships.

Site preparation and stand establishment: Site preparation, stand maintenance, stand protection, and release practices would be designed to be consistent with ecological site capabilities and would utilize approaches which were ecosystem based. The approaches would utilized biological methods, prescribed burning, chemical treatments, and mechanical or manual treatments to meet plan

objectives and be consistent with decisions in the anticipated Management of Competing Vegetation Record of Decision. Actions would emphasize the use of preventative or ecosystem-based strategies within an integrated approach which considers all available tools, natural ecological processes, human health, economics, fire hazard, environmental quality, and the maintenance of site productivity. Site preparation treatments would occur promptly after yarding to assure timely reforestation.

Hardwood Conversion to Conifers: Natural hardwood and shrub communities on suitable commercial forest land would not be converted to conifer production. Stands on commercial forest land which are dominated by commercial conifers, but which also contain a high percentage of hardwoods at a successional stage, would be managed for timber production. Suitable commercial forest land allocated to timber management and dominated by grass, shrubs, and hardwoods which resulted from human activity would be restored to conifer protection. Enough hardwood species would be retained to maintain species diversity.

Minimum Harvest Age: The minimum harvest age varies by district, ranging from 60 to 120 years.

Allowable Sale Quantity: The allowable sale quantity is based on planned timber harvest. Volume sold per year would be as evenly distributed as possible during the decade. Generally, salvage or other unplanned harvest would replace the planned sale volume.

Utilization standards: Sale of forest products would be designed to encourage full utilization of harvested timber while reserving structural components (such as snags and coarse woody debris) consistent with objectives for wildlife habitat management, old-growth management, biological diversity, and site productivity.

Logging systems: Harvesting methods and yarding systems would be selected based on suitability for the successful implementation of silvicultural systems, operational and economic practicality, and protection of site productivity and water quality.

Roads: The timber access road network for lands allocated to timber management would be based on attainment of ready access for appropriate logging systems, silvicultural treatments, and fire protection. Road management planning would include access needed for silvicultural treatments, inventory, and other administrative work. Planned road maintenance would protect the existing investment and watershed values.

Special Forest Products

Objectives

Sale of special forest products (firewood, burls, mushrooms, ferns, floral greens, etc.) would be consistent with other land use allocations. Sales would ensure resource sustainability and protection of other resource values such as special status plants or animals species. The market value of such products would be based on their highest and best use.

Develop special forest product programs to support economic diversity of local resource dependent communities.

Land Use Allocations

Sale of special forest products would be consistent with the objectives for other land use allocations. Areas that would not be available for the sale of special forest products could include:

Areas of Critical Environmental Concern
Research Natural Areas
Outstanding Natural Areas
Special Status fauna and flora sites
Wilderness
Wild river areas
Areas used by American Indians under existing treaties

Management Actions/Direction

Species or groups of plants that would be restricted or limited from harvest would vary by district.

Silvicultural Systems

The silviculture for the various land use allocations essentially has not been changed for the revised Draft Plans. Although, the Connectivity Areas were redesigned on the landscape level, the silvicultural approach remained the same with the exception of the retention of 25 percent of the oldest forest within the Connectivity/Diversity Blocks.

[Insert **PLACEHOLDER Table B1-3**. HALF PAGE]

[Insert PLACEHOLDER FOR FIGURES B1-1 THROUGH B1-6 11 FULL PAGES]

Appendix B2
Ecological Principles for Management of Late-Successional Forests

This section of Appendix B is adapted from the FEMAT Report to provide additional information on the objectives and assumptions regarding management to protect and enhance habitat for late-successional and old-growth related species. It clarifies the intent of the standards and guidelines in order to provide guidance for situations not specifically covered by the standards and guidelines. A similar discussion of the aquatic/riparian system is found in the Aquatic Conservation Strategy, Appendix B6. This section applies to all alternatives.

General Ecological Basis For Forest Management

Late-successional forests are those forest seral stages that include mature and old-growth age classes (Thomas et al. 1993). One goal of the alternatives is to maintain late-successional and old-growth species habitat and ecosystems on federal lands. The alternatives differ in the means and the likelihood of achieving this goal. Another goal of forest management on federal lands is to maintain biological diversity associated with native species and ecosystems in accordance with laws and regulations. Forest ecosystems are quite variable throughout the range of the northern spotted owl. Therefore, site-specific knowledge of ecosystems will be incorporated into watershed-level analysis and integrated into province-level plans.

In Late-Successional Reserves, standards and guidelines are designed to maintain late-successional forest ecosystems and protect them from loss due to large scale fire, insect and disease epidemics, and major human impacts. The intent is to maintain natural ecosystem processes such as gap dynamics, natural regeneration, pathogenic fungal activity, insect herbivory, and low intensity fire. In some alternatives, standards and guidelines encourage the use of silvicultural practices to accelerate the development of overstocked young plantations into stands with late-successional and old-growth forest characteristics, and to reduce the risk to Late-Successional Reserves from severe impacts resulting from large-scale disturbances and unacceptable loss of habitat.

The matrix is an integral part of the management direction included in all alternatives. Production of timber and other commodities is an important objective for the matrix. However, forests in the matrix function as connectivity between Late-Successional Reserves and provide habitat for a variety of organisms associated with both late-successional and younger forests. Standards and guidelines for the matrix are designed to provide for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees. The matrix will also add ecological diversity by providing early-successional habitat.

Structure and Composition

The structure and composition of late-successional and old-growth forest ecosystems have been detailed in numerous publications (e.g., Franklin et al. 1981; Spies and Franklin 1988, 1991). Franklin

et al. (1981) identified four major structural attributes of old-growth Douglas-fir forests: live old-growth trees, standing dead trees (snags), fallen trees or logs on the forest floor, and logs in streams. Additional important elements typically include multiple canopy layers, smaller understory trees, canopy gaps, and patchy understory (Spies et al. 1990). Structural characteristics of late-successional and old-growth forests vary with vegetation type, disturbance regime, and developmental stage. For example, in many Douglas-fir stands in western Oregon and Washington, the mature phase of stand development begins around 80 years and is characterized by relatively large live and dead trees (Spies and Franklin, in press), although multiple canopy layers may not yet be well developed. In some forest types subject to frequent, low intensity fire, such as ponderosa pine, the late-successional and old-growth stages are typically characterized by relatively open understories and relatively few large fallen trees (in comparison to more moist Douglas-fir/western hemlock types). Standards and guidelines designed to promote the desired conditions vary among physiographic provinces because characteristics of the natural structure and composition of late-successional and old-growth forests also vary among the provinces.

Ecological Processes

Ecological processes include those natural changes that are essential for the development and maintenance of late-successional and old-growth forest ecosystems. Although the processes that created the current late-successional and old-growth ecosystems are not completely understood, they include: (1) tree growth and maturation, (2) death and decay of large trees, (3) low-to-moderate intensity disturbances (e.g., fire, wind, insects, and diseases) that create canopy openings or gaps in the various strata of vegetation, (4) establishment of trees beneath the maturing overstory trees either in gaps or under the canopy, and (5) closing of canopy gaps by lateral canopy growth or growth of understory trees. These processes result in forests moving through different stages of late-successional and old-growth conditions that may span 80 to 1,200 years for forests dominated by long-lived species.

Several authors have described these stages (Bormann and Likens 1979; Oliver 1981; Peet and Christensen 1987), and Spies and Franklin (in press) have expanded these descriptions to include the protracted nature of stand development in forests dominated by long-lived trees such as Douglas-fir. Following stand-replacement disturbance, these stages can be described as: (1) establishment, (2) thinning, (3) maturation, (4) transition, and (5) shifting-gap.

The maturation stage (3) is characterized by a slowed rate of height growth and crown expansion. Heavy limbs begin to form; gaps between crowns become larger and more stable, or expand from insect and pathogen mortality. Large dead and fallen trees begin to accumulate, and the understory may be characterized by seedlings and saplings of shade-tolerant tree species. In Douglas-fir stands west of the Cascade Range, this stage typically begins between 80 and 140 years, depending on site conditions and stand history.

During the transition stage (4), the original component of overstory trees approaches its maximum height and diameter, and growth is slow. Tree crowns become more open, irregular in shape and contain heavy limbs. Broken, dead, and decaying portions of tree crowns are common. Old trees become relatively resistant to low-to-moderate intensity fire and, depending on species, crown bases are high above the understory and bark is relatively thick. During this stage, understory trees form multiple canopy layers. Coarse woody debris accumulates to relatively high levels, and low-to-moderate intensity disturbances from insects, diseases, wind, and fire create patchy openings and accumulations of standing dead trees. These disturbances also frequently promote establishment or

advancement of understory trees that eventually fill the holes in the canopy. In Douglas-fir stands west of the Cascade Range, this stage begins between 150 to 250 years, and may last for an additional 300 to 600 years depending on site conditions and species.

The shifting-gap stages begins when the last of the original component of overstory old-growth trees dies and all trees in the canopy have established following smaller gap-type disturbances of various types. Forests in the last two stages of development (4 and 5) actually contain all of the stand developmental stages in a relatively fine-grained mosaic of smaller stands. The later three stages (3, 4, and 5) embody the late-successional and old-growth conditions that are the focus of this SEIS.

Some of the stand development processes, such as tree growth and mortality, and understory establishment, can be accelerated through silvicultural manipulations. Most of the alternatives provide for the acceleration of these processes in younger stands. Other processes such as tree crown maturation, bark thickening, and tree bole decay are not readily accelerated through silviculture. Because of limitations in knowledge of late-successional and old-growth forest processes and lack of silvicultural experience in old stands, it is not certain that old-growth ecosystems can be completely replicated.

Most of the current late-successional and old-growth stands developed from natural regeneration following wildfire events that occurred during the last 500 to 600 years. These fires covered large areas--frequently many thousands of acres. Although these fires were large, they burned in patches of variable intensity and severity, and left many areas of unburned or lightly burned forest. The natural regime of patchy fires that leave an abundance of large dead trees and lesser amounts of scattered live trees, as individuals and in patches, is the basis for silvicultural methods such as retention of green trees as individuals and in patches.

In some cases, however, natural reburns occurred, resulting in relatively little carryover of live trees as a legacy from the old-growth condition. Where considerable live and dead material was left following fires, young stands contained many old-growth structures and presumably old-growth associated organisms, including organisms associated with coarse woody debris on the forest floor.

Large fires and relatively long fire return intervals in the moist northern and western physiographic provinces resulted in periods during which landscapes contained large areas of relatively unbroken forest cover. In the warmer, drier physiographic provinces (i.e., the Washington and Oregon Eastern Cascades, the California Cascades, and the Oregon and California Klamath Provinces), fire is more frequent, less intense, and is an integral part of the internal dynamics of a typical stand (tens to hundreds of acres). In the drier provinces, fire control and timber harvest have decreased the abundance of some types of old growth, such as ponderosa pine, that are dependent on frequent, low intensity fires. Other types of late-successional forest that are less fire resistant or are less desirable for harvest have become more widely distributed. In these areas, the potential for stand-replacement wildfires has increased, resulting in a higher risk to the stability of current stands reserved for late-successional species.

At a landscape scale and over long periods, stand-replacing wildfires have an important role in resetting successional processes and developing new areas of late-successional forests to replace those lost through succession or disturbance. Silvicultural practices designed to imitate natural processes may be able to reset succession to achieve stand and landscape level goals. This type of silviculture may meet a variety of ecosystem objectives. However, experience in applying silviculture for late-successional objectives is limited. Until more experience and knowledge about active management to

produce late-successional ecosystems is gained, sustaining late-successional ecosystems in the landscape will be best accomplished through retention of existing areas of late-successional forest. Given the relatively low remaining proportion of late-successional ecosystem in the landscape at the present time, these older forests should be protected from fire and other stand resetting disturbances.

Ecosystem Functions

Late-successional ecosystems perform several ecological functions that appear to be lacking, or less well developed, in younger natural forests and managed plantations. These functions include buffering microclimates during seasonal climatic extremes (Chen et al. 1993), producing food for those consumer organisms that occupy late-successional forests (Huff et al. 1991, Ure and Maser 1982), storing carbon (Harmon et al. 1990), providing nutrient and hydrological cycling (Franklin and Spies 1991), and providing sources of arthropod predators and organisms beneficial to other ecosystems or successional stages (Schowalter 1989). Old-growth ecosystems appear to have high retention of nutrients (Sollins et al. 1980) and low soil erosion potential (Swanson et al. 1982), although differences in these functions between stand developmental stages may not be large when canopy closure has occurred. Tall, deep canopies of late-successional forests can also intercept more moisture from clouds and fog than young plantations (Harr 1982).

Late-Successional Reserves

All alternatives include reserves designed to maintain and enhance late-successional forests as a network of existing old-growth forest ecosystems, although their size, distribution, and management varies. These reserves represent a network of existing old-growth forests that are retained in their natural condition with natural processes, such as fire, allowed to function to the extent possible. The reserves are designed to serve a number of purposes. First, they provide a distribution, quantity, and quality of old-growth forest habitat sufficient to avoid foreclosure of future management options. Second, they provide habitat for populations of species that are associated with late-successional forests. Third, they will help ensure that late-successional species diversity will be conserved.

Late-successional forest communities are the result of a unique interaction of disturbance, regeneration, succession, and climate that can never be recreated in their entirety through management. The structure, species composition, and function of these forests are in their entirety not fully understood. However, silvicultural restoration can accelerate the development of some of the structural and compositional features of such forests. Because they will regenerate by different processes during a different time period than existing late-successional forests, silviculturally created stands may look and function differently from current old-growth stands that developed over the last 1,000 years. Consequently, conservation of a network of natural old-growth stands maintains biodiversity into the future.

Desired late-successional and old-growth characteristics that will be created as younger stands change through successional development include: (1) multispecies and multilayered assemblages of trees, (2) moderate-to-high accumulations of large logs and snags, (3) moderate-to-high canopy closure, (4) moderate-to-high numbers of trees with physical imperfections such as cavities, broken tops, and large deformed limbs, and (5) moderate-to-high accumulations of fungi, lichens, and bryophytes. Although they may not be duplicates of existing old-growth forests, these stands could provide adequate habitat for many species in the long term.

The Role of Silviculture

Silviculture is the art and science of managing forest stands to provide or maintain structures, species composition, and growth rates that contribute to forest management goals. Silvicultural practices under the selected alternative will vary considerably because of the broad variety of forest species and ecosystems within the range of the northern spotted owl. The ecosystems range from coastal temperate rain forests where fire occurs infrequently, but where wind may have a major impact, to forests on dry interior sites where disturbance by natural fire and insects is common. Within specific locales, the silvicultural practices will be strongly influenced by such factors as nearby residential areas, local wildlife habitat requirements, and fire management constraints.

Silvicultural systems proposed for Late-Successional Reserves have two principal objectives: (1) development of old-growth forest characteristics including snags, logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition; and (2) prevention of large-scale disturbances by fire, wind, insects, and diseases that would destroy or limit the ability of the reserves to sustain viable forest species populations (Tappeiner et al. 1992). Small-scale disturbances by these agents are natural processes, and will be allowed to continue.

Matrix objectives for silviculture should include: (1) production of commercial yields of wood, including those species such as Pacific yew and western red cedar that require extended rotations, (2) retention of moderate levels of ecologically valuable old-growth components such as snags, logs, and relatively large green trees, and (3) increasing ecological diversity by providing early-successional habitat.

Stand Management

Forests within Late-Successional Reserves are composed of managed stands from 2 to over 80 years old, as well as unmanaged, late-successional, and old-growth stands. The younger stands were usually established following fire or timber harvest. Some of these stands will develop old-growth characteristics without silvicultural intervention. However, current stocking and structure of some of these stands were established to produce high yields of timber, not to provide for old-growth-like forests. Consequently, silviculture can accelerate the development of young stands into multilayered stands with large trees and diverse plant species, and structures that may, in turn, maintain or enhance species diversity. Tappeiner et al. (1992) discussed management of forest stands for northern spotted owl habitat, including examples of silvicultural systems and treatments that resemble natural forest disturbances.

Stand management in Late-Successional Reserves is proposed to focus on stands that have been regenerated following timber harvest or stands that have been thinned. These include stands that will acquire late-successional characteristics more rapidly with treatment, or are prone to fire, insects, diseases, wind, or other disturbances that would jeopardize the reserve. Depending on stand conditions, treatments could include, but not be limited to: (1) thinning or managing the overstory to produce large trees; release advanced regeneration of conifers, hardwoods, or other plants; or reduce risk from fire, insects, diseases, or other environmental variables, (2) underplanting and limited understory vegetation control to begin development of multistory stands, (3) killing trees to make snags and coarse woody debris, (4) reforestation, and (5) use of prescribed fire.

Stands in the matrix can be managed for timber and other commodity production, and to perform an important role in maintaining biodiversity. Silvicultural treatments of forest stands in the matrix can provide for retention of old-growth ecosystem components such as large green trees, snags and down logs, and depending on site and forest type, can provide for a diversity of species. Retention of green trees following timber harvest in the matrix provides a legacy that bridges past and future forests. Retaining green trees serves several important functions including snag recruitment, promoting multistoried canopies, and providing shade and suitable habitat for many organisms in the matrix.

Retaining of green trees of various sizes, ages, and species, in well-distributed patches as well as dispersed individuals, will promote species diversity. These trees may also act as refugia or centers of dispersal for many organisms including plants, fungi, lichens (Esseen et al. 1992), small vertebrates, and arthropods. Patches of trees may provide protection for special microsites such as seeps, wetlands, or rocky outcrops. Trees retained within the Riparian Reserves can contribute to overall retention objectives, but will generally not be sufficiently dispersed across the landscape to fully satisfy these objectives. Diversity of tree structure should be considered when selecting trees for retention. Complex canopy structure and especially leaning boles are beneficial for some lichens (Esseen et al. 1992). Trees that are asymmetrical provide a diversity of habitat substrates, and often have more lichen and moss epiphytes on large lateral limbs than symmetrical trees. Location of green trees is also important (e.g., ridgelines are optimal locations for lichen dispersal).

Coarse woody debris is essential for many species of vascular plants, fungi, liverworts, mosses, lichens, arthropods, salamanders, reptiles and small mammals. Because of drier microclimates, logs in the matrix may be occupied by species different from those found on coarse woody debris in late-successional forests. However, these logs may provide transitional islands for the maintenance and eventual recovery of some late-successional organisms in the matrix.

In the matrix, snags support populations of cavity nesters. Snags could be created in matrix stands if they are lacking, but there is uncertainty concerning the efficacy of killing trees to provide snags.

Adequate numbers of large snags and green trees are especially critical for bats because these trees are used for maternity roosts, temporary night roosts, day roosts, and hibernacula. Large snags and green trees should be well distributed throughout the matrix because bats compete with primary excavators and other species that use cavities. Day and night roosts are often located at different sites, and migrating bats may roost under bark in small groups. Thermal stability within a roost site is important for bats, and large snags and green trees provide that stability. Individual bat colonies may use several roosts during a season as temperature and weather conditions change. Large, down logs with loose bark may also be used by some bats for roosting.

Local information should be used to refine requirements for quantity, size, spacing, and distribution of snags and down logs. Guides for the retention of snags and down logs must be responsive to safety considerations during logging and other forest operations.

Thinning prescriptions should encourage development of diverse stands with large trees and a variety of species in the overstory and understory. Prescriptions should vary within and among stands.

Management of Disturbance Risks

Natural disturbance is an important process within late-successional forest ecosystems, but humans have altered disturbance regimes. Management may be required to reintroduce natural disturbance, such as fire, or to minimize socially unacceptable impacts. Fire suppression has resulted in significant

increases in accumulated fuels within some forests, particularly in the Washington and Oregon Eastern Cascades Provinces, the California Cascades Province, and the Oregon and California Klamath Provinces (Agee 1990; Deeming 1990; Kauffman 1990). At the same time, these forests may have become much more vulnerable to insects and diseases (Mitchell 1990; Mutch et al. 1993, Wickman 1992).

In Late-Successional Reserves in the Washington Western Cascades and coastal areas of Oregon and Washington, manipulation of natural stands to reduce fire hazard is generally not necessary due to a lower occurrence of fire. However, fuel management may be desirable in plantations.

In Late-Successional Reserves in the Eastern Cascades or Klamath Provinces, silviculture aimed at reducing the risk of stand-replacing fires may be appropriate. Treatments may include thinning and underburning. Due to fire suppression, some forests have become quite dense and multistoried, primarily from the invasion of shade-tolerant species (Tappeiner et al. 1992). Density reduction in mid-level canopy layers by thinning may reduce the probability of crown fires.

Underburning can be used to reduce fuel loading and vertical fuel continuity. Wildfires in stands that are managed using underburning are generally less severe, and fire suppression is aided. To increase effectiveness, underburning should be implemented over large areas (Agee and Edmonds 1992). Such activities in older stands in westside provinces may be warranted when levels of fire risk are high. Compartmentalized landscape units of reduced fuel allow safe access for fire suppression crews and provide strategic locations for efficient and effective fire suppression. Stands are manipulated to reduce continuity of canopies, boles are pruned on residual trees, and significant quantities of understory fuels are removed (Agee and Edmonds 1992). Many of these treatments may reduce the quality of habitat for late-successional organisms. Thus, managers need to seek a balanced approach that reduces risk of fire while protecting large areas of fire-prone late-successional forest.

Silvicultural systems within the matrix contribute to management of the Late-Successional Reserves. Fire and fuels management in the matrix can reduce the risk of fire and other large-scale disturbances that would jeopardize the reserves. Harvesting trees immediately adjacent to Late-Successional Reserves may result in increased wind damage along boundaries. In such cases, "feathering" stands within harvest units may be appropriate to reduce this risk. Local expertise will be essential in designing meaningful strategies for wind protection (Agee and Edmonds 1992).

Management After Natural Disturbance

Fire, wind, insects, and diseases have greatly influenced the development of Pacific Northwest forests (Agee 1990, 1991; Agee and Edmonds 1992; Kauffman 1990). Fine-scale disturbances, generally by insects or diseases, cause deaths of single trees or small groups of trees which result in small patches of early-successional vegetation embedded in a larger portion of older forest. Coarse-scale disturbances, such as fire and wind, result in more extensive areas of early-seral vegetation. Many native forest organisms have adapted to these cycles and scales of disturbance and regrowth.

Most alternatives have provisions for management following natural disturbances in Late-Successional Reserves. Direct silvicultural management may be appropriate following disturbances such as extensive, high-severity fires. Smaller scale disturbances, such as those caused by insects, diseases, and wind, create small gaps in the overstory that characterize the transition and shifting-gap stages of old-growth forest development (Spies and Franklin 1989; Spies et al. 1990).

Tree mortality is an important and natural process within a forest ecosystem. Diseased and damaged trees and logs are key structural components of late-successional and old-growth forests (Franklin and Spies 1991; Spies and Franklin 1991). Salvage of dead trees affects the development of future stands and habitat quality for a number of organisms. Snag removal may result in long-term influences on forest stands because large snags are not produced in natural stands until trees become large and begin to die from natural mortality. Snags are used extensively by cavity-nesting birds and mammals such as woodpeckers, nuthatches, chickadees, squirrels, red tree voles, and American marten (Carey et al. 1991; Gilbert and Allwine 1991a,b; Lundquist and Mariani 1991; Thomas et al. 1993). Removal of snags following disturbance can reduce the carrying capacity for these species for many years.

Coarse woody debris is a necessary component of forest ecosystems. This wood provides habitat for a broad array of vertebrates, invertebrates, fungi, mosses, vascular plants, and micro-organisms. Arthropods, salamanders, reptiles, and small mammals live in or under logs; woodpeckers forage on them; and vascular plants and fungi grow on rotting logs (Harmon 1986, Thomas et al. 1933). Provision for retention of snags and logs normally should be made, at least until the new stand begins to contribute coarse woody debris (USDI unpub.).

Many natural disturbances do not result in complete mortality of stands. For example, recent fires in the Oregon Western Cascades Province killed 25 to 50 percent of trees within the areas burned, leaving 50 to 75 percent of the stands intact (USDA FS 1988, 1989, 1992b). The surviving trees are important elements of the new stand. They provide structural diversity and a potential source of additional large snags during the development of new stands. Furthermore, trees injured by disturbance may develop cavities, deformed crowns, and limbs that are habitat components for a variety of wildlife species.

In the matrix, objectives for post-disturbance management will generally differ from those for Late-Successional Reserves. Economic benefits of timber production will receive greater consideration. For example, the commercial salvage of dead trees will be less constrained, and replanting disturbed areas will be a high priority. However, because the matrix provides habitat and connectivity for many organisms, post-disturbance management must achieve a balance between economic and ecosystem objectives.

Appendix B3
Adaptive Management Areas

Applicable to Alternative 9 only, the following section, which is adapted from the FEMAT Report, describes the overall objectives for Adaptive Management Areas as well as more specific objectives for each particular area. Because a primary objective of these areas is innovation, more specific standards and guidelines for management are not provided.

Introduction

Adaptive Management Areas are landscape units designated to encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives. Ten areas ranging from about 92,000 to nearly 500,000 acres of federal lands have been identified. The areas are well distributed in the physiographic provinces. Most are associated with subregions impacted socially and economically by reduced timber harvest from the federal lands. The areas provide a diversity of biological challenges, intermixed land ownerships, natural resource objectives, and social contexts. In the Applegate Adaptive Management Area in Oregon, grassroots community-based activities have already begun.

The Adaptive Management Areas are specifically designated in Alternative 9, but the concept could be applied within any of the alternatives. Specific boundaries of the areas would have to be modified consistent with particular alternatives, and biological, economic, and social assessments would have to be revised to be consistent with those allocations.

The overall objective for Adaptive Management Areas is to learn how to manage on an ecosystem basis in terms of both technical and social challenges, and in a manner consistent with applicable laws. It is hoped that localized, idiosyncratic approaches that may achieve the conservation objectives of the selected alternative can be pursued. These approaches rely on the experience and ingenuity of resource managers and communities rather than traditionally derived and tightly prescriptive approaches that are generally applied in management of forests.

The Adaptive Management Areas are intended to contribute substantially to the achievement of objectives for Alternative 9. This includes provision of well-distributed late-successional habitat outside of reserves, retention of key structural elements of late-successional forests on lands subjected to regeneration harvest, and restoration and protection of riparian zones as well as provision of a stable timber supply.

The Adaptive Management Area concept incorporates the three adaptive management models/objectives discussed in the FEMAT Report--technical, administrative, and cultural/social.

Key features of the Adaptive Management Areas:

- The areas are well-distributed geographically, represent a mix of technical and social challenges and are of sufficient size to provide for landscape-level management approaches.

- The areas provide for development and demonstration of monitoring protocols and new approaches to land management that integrate economic and ecological objectives based on credible development programs and watershed and landscape analysis.

- Opportunities exist for education, including technical training, to qualify local community residents for employment in monitoring and other management programs.

- Innovation in community involvement is encouraged, including approaches to implementation of initial management strategies and perhaps, over the longer term, development of new forest policies.

- Innovation is expected in developing adequate and stable funding sources for monitoring, research, retraining, restoration and other activities.

- Innovation in integration of multi-ownership watersheds is encouraged among federal agencies and is likewise encouraged among state and federal agencies, and private landowners.

- Innovation in agency organization and personnel policies might include individual certification requirements, and modification of recruitment and promotion procedures to encourage local longevity among the federal workforce.

Selection of the Adaptive Management Areas

Adaptive Management Areas were selected to provide opportunities for innovation, to provide examples in major physiographic provinces, and to provide a range of technical challenges, from an emphasis on restoration of late-successional forest conditions and riparian zones to integration of commercial timber harvest with ecological objectives.

The Adaptive Management Areas have been geographically located to minimize risk to achieving the conservation objectives of Alternative 9. The designation of Adaptive Management Areas was intended to provide a mixture of public and private lands. In locating the Adaptive Management Areas, the proximity of communities that were subject to adverse economic impact resulting from reduced federal timber harvest was considered. The social and economic analysis of the Forest Ecosystem Management Assessment Team was a major source of information that helped guide these decisions.

The Adaptive Management Areas incorporate a mix of ownerships and administrative responsibilities. Six areas include lands administered by the Forest Service and Bureau of Land Management. In two areas (Northern Coast Range and Olympic) there are significant opportunities for the states to participate in a major cooperative adaptive management effort. The majority of areas also have interspersed privately owned forest lands that could be incorporated into an overall plan if landowners so desired.

Establishment of the Adaptive Management Areas is not intended to discourage the development of innovative social and technical approaches to forest resource issues in other locales. They are intended to provide a geographic focus for innovation and experimentation with the intent that such experience will be widely shared. The array of areas provides a balance between having a system of areas that is:

(1) so large and diffuse that it lacks focus and adequate resources; and has extensive management constraints because of its size and overall impact on regional conservation strategies; and (2) too small to allow for meaningful ecological and social experimentation.

Technical Objectives

Two Adaptive Management Areas have scientific and technical innovation and experimentation as objectives. The guiding principle is to allow freedom in forest management approaches to encourage innovation in achieving the goals of the selected alternative. This challenge includes active involvement by the land management and regulatory agencies early in the planning process.

The primary technical objectives of the Adaptive Management Areas are development, demonstration, implementation, and evaluation of monitoring programs and innovative management practices that integrate ecological and economic values. Experiments, including some of large scale, are likely. Demonstrations and pilot projects alone, while perhaps significant, useful, and encouraged in some circumstances, may not be sufficient to achieve the objectives.

Monitoring is essential to the success of any selected alternative and to an adaptive management program. Hence, development and demonstration of monitoring and training of the workforce are technical challenges and should be emphasized.

Technical topics requiring demonstration or investigation are a priority for Adaptive Management Areas and cover a wide spectrum, from the welfare of organisms to ecosystems to landscapes. Included are development, demonstration, and testing of techniques for:

- Creation and maintenance of a variety of forest structural conditions including late-successional forest conditions and desired riparian habitat conditions.

- Integration of timber production with maintenance or restoration of fisheries habitat and water quality.

- Restoration of structural complexity and biological diversity in forests and streams that have been degraded by past management activities and natural events.

- Integration of the habitat needs of wildlife (particularly of sensitive and threatened species) with timber management.

- Development of logging and transportation systems with low impact on soil stability and water quality.

- Design and testing of effects of forest management activities at the landscape level.

- Restoration and maintenance of forest health using controlled fire and silvicultural approaches.

Each Adaptive Management Area will have an interdisciplinary technical advisory panel, including specialists from outside government agencies, that will provide advice and support to managers and local communities involved with this effort.

Social Objectives

The primary social objective of Adaptive Management Areas is the provision of flexible experimentation with policies and management. These areas should provide opportunities for land managing and regulatory agencies, other government entities, nongovernmental organizations, local groups, landowners, communities, and citizens to work together to develop innovative management approaches. Broadly, Adaptive Management Areas are intended to be prototypes of how forest communities might be sustained.

Innovative approaches include social learning and adaptation, which depend upon local communities having sufficient political capacity, economic resources, and technical expertise to be full participants in ecosystem management. Similarly, management will need to be coordinated and characterized by collaboration across political jurisdictions and diverse ownerships. This will require mediating across interests and disciplines, strengthening local political capability, and enhancing access to technical expertise. Adaptive management is, by definition, information dependent. Setting objectives, developing management guidelines, educating and training a workforce, organizing interactive planning and management institutions, and monitoring accomplishments all require reliable, current inventories. New information technologies can be used to provide such information, but a well-trained workforce necessary to collect and assimilate required information is largely lacking. Local persons might be ideally suited to this task if appropriately trained.

Agency Approaches and Management Review

Federal agencies are expected to use Adaptive Management Areas to explore alternative ways of doing business internally, and with each other, other organizations, local and state government, and private landowners. In effect, the areas should be used to "learn to manage" as well as to "manage to learn."

Agencies are expected to develop plans (jointly, where multiple agencies are involved) for the Adaptive Management Areas. Development of a broad plan that identifies general objectives and roles, and provides flexibility should be the goal. Such a plan could be used in competing for financial resources, garnering political support, providing a shared vision, and identifying experiences to be tracked.

If the Adaptive Management Areas are to make timely contributions to the objectives of the selected alternative and to the communities, it is absolutely critical that initiation of activities not be delayed by requirements for comprehensive plans or consensus documents beyond those required to meet existing legal requirements for activities. Development of such documents can proceed simultaneously with other activities; the only area in which detailed planning must precede any activities is the Snoqualmie Pass Adaptive Management Area. Current plans and draft plan preferred alternatives, as modified by the directions established in the selected alternative, can provide the starting point for activities. Initial involvement of user groups and communities would emphasize how the strategy and plans should be implemented.

Initial direction and continuing review should be provided by the Regional Interagency Executive Committee. It is important that the interagency coordination involve both the regulatory and management agencies, and that the regulatory agencies participate in planning and regular review processes.

Adaptive Management Area Implementation Guidelines

Role of Agencies - The agencies will facilitate collaborative efforts, partnerships, mutual learning and innovation. They will provide staff work to the process of managing the Adaptive Management Areas. This could include providing meeting places, meeting facilitation, and expert analysis. Agency scientists are expected to provide scientific design of monitoring and experiments, though the decision is reserved for the federal land manager.

Although the agencies have a facilitation role, the land management agencies retain the authority and responsibility to make decisions and the regulatory agencies retain the authority and responsibility to regulate. Nothing in these guidelines is intended to change those authorities or responsibilities.

Local Communities - Specific community roles with public agencies and subject matter experts (such as the technical advisory panels) will include helping find innovative ways to set objectives, develop plans, implement projects, and monitor accomplishments. For example, Subtitle G of the Farm Bill gives criteria to identify "natural resource dependent communities" which may be used if appropriate when identifying local communities.

Participation in Adaptive Management Areas - Although the emphasis is on the participation of people who are actively involved with that geographic location, nothing in these guidelines should be construed to suggest that the interests of people living outside "local communities" should not be considered in making agency decisions. Participation will be self identifying, to the extent possible. Experiments to address how this might happen are encouraged.

Project Development and Implementation - Specific project planning must:

* Involve the public early
* Coordinate with overall activities within the province
* Begin some projects as soon as practicable to respond to and facilitate public interest and involvement
* Begin some projects prior to completing an entire watershed analysis
* Begin watershed analysis as soon as possible
* Develop early plans and projects with the best available information
* Identify needs for improved inventory
* Proceed simultaneously with activities and Adaptive Management Area planning
* Assign priority status to watershed restoration projects that can be completed quickly
* Begin projects in nonsensitive sections of the Adaptive Management Area

Plans - All Adaptive Management Areas will have a plan. An individual public, interagency approach to planning will be developed for each Adaptive Management Area. The plan should address or provide:

* A shared vision of the Adaptive Management Area, (e.g., the kind of knowledge the participants hope to gain). Identification of the desired future conditions may be developed in collaboration with communities, depending on the area.
* Learning should include social and political knowledge, not just biological and physical information.

* A strategy to guide implementation, restoration, monitoring and experimental activities.
* A short-term (3 to 5 year) timber sale plan and long-term yield projections.
* Education of participants.
* List of communities influenced by the Adaptive Management Area projects and outputs.
* An inventory of community strategies, and resources and partners being used.
* Coordination with overall activities within the province.
* A funding strategy.
* Integration of the community strategies and technical objectives.

Area Assessment - The plans need to be based on information about historical, current and desired future conditions of the biophysical, social, and economic aspects of the area. The plans will rely largely on existing information. The area assessment will be a concise working document. The following is provided as a suggested framework:

Biophysical: Consider disturbance history, terrestrial and aquatic conditions, sensitive plant and animal species and/or habitat, capability of the system to produce a variety of forest products. A description of the desired future condition or a range of acceptable conditions for the biophysical system is needed. For example, what functions are important to maintain at the landscape level? What structure, species, age classes, and/or arrangement will maintain those functions? Consider both coarse and fine detail over time. What does the community want the Adaptive Management Area to be like in the future? What actions are needed to create that desired future condition?

Social: Consider historical and extant communities, their use patterns, uses of the land, issues, resources, and opportunities. In some areas, other demographic data will be helpful as well. What networks for communications are at work? How can the agencies better interact with these? What collaborative process will work best for the communities of interest to effectively participate in managing the Adaptive Management Area? What does the community want to look like in the future? Desired future social condition can be considered in terms of composition, structure, and/or functions over time.

Economic: A description of current economic conditions might include an inventory of local employment, resource workers, skills, and access to technology. Desired future conditions could describe the future employment opportunities (e.g., what forest work will be needed in the future?) and skills needed to seize those opportunities. As the desired future condition of the ecosystem is better understood, the future forest work will also be more clear. Identification of needed knowledge, skills, abilities, and technology for the future may be useful in developing training programs as well as business or marketing assistance.

Monitoring and Research - The Monitoring and Evaluation Plan (see Appendix I) and watershed analysis present the framework and some required actions for each Adaptive Management Area. Additional efforts and specificity may be developed for each Adaptive Management Area.

The learning opportunity provided by Adaptive Management Areas will be enhanced if clear, measurable goals and objectives are set, monitored, and conveyed into the planning of projects or into the appropriate component of the Adaptive Management Area plan or Forest or District Plan. Shared synthesis of monitoring results will help provide a multiple-perspective assessment on whether social and ecosystem goals are being met, help identify problems to avoid in subsequent projects, and help gain consensus on what data gaps exist and what changes to the monitoring and research programs are needed.

Review - Monitoring and research, with careful experimental design, will be conducted in Adaptive Management Areas. Research in forest ecology and management as well as social, biological, and earth sciences may be conducted. Each Adaptive Management Area will have an interdisciplinary technical advisory panel that will provide advice to managers and the local communities involved with this effort. The technical advisory panels will provide advice and information on the appropriateness of the project.

Direction and review are provided by the Regional Interagency Executive Committee, through the Regional Ecosystem Office. This review will help assure that plans and projects developed for the various Adaptive Management Areas will be both scientifically and ecologically credible. It will assure that new, innovative approaches are used, that the laws and the goals of the plan are met, and that validation monitoring is incorporated.

The Regional Ecosystem Office will facilitate and coordinate the implementation of the Adaptive Management Area program. Federal agencies are expected to use the Adaptive Management Areas to explore new ways of working internally and externally.

Legal - All activities must comply with existing laws such as ESA, NEPA, NFMA, FLPMA, FACA, National Historic Preservation Act, Clean Water Act, Clean Air Act, and treaty rights. Management and regulatory agencies should work together to determine ways to expedite management while ensuring compliance, to improve cooperation through planning and on-the-ground consultation, and to avoid confrontation.

Other Issues - Some issues are beyond the authority of the agencies or the Regional Interagency Executive Committee. These include:

* Use of receipts from timber sales and other products derived from Adaptive Management Areas to develop programs and projects within the areas
* Employment targets for local people for special jobs like planning, training, and monitoring
* Special land management or stewardship contracts
* Restricted local use of wood and other products derived from Adaptive Management Areas.

Timber Supply

One reason for locating Adaptive Management Areas adjacent to communities experiencing adverse economic impacts is to provide opportunity for social and economic benefits to these areas. Adaptive Management Areas are expected to produce timber as part of their program of activities consistent with their specific direction under the selected alternative. The rates and methods of harvest will be determined on an area-by-area basis. Each area management team is expected to develop a strategy for ecosystem management as part of the Adaptive Management Area plan to guide implementation, restoration, monitoring, and experimental activities involving timber sales. The strategy should contain a short-term (3 to 5 year) timber sale component and an assessment of long-term outputs of timber.

Education

Each Adaptive Management Area was located adjacent to one or more communities with economies and culture long associated with utilization of forest resources. As a result, the people have a "sense of

place" and desire for involvement. Many of these local workers already possess timber/forest-related skills and knowledge, as well as that sense of place, which in combination make them natural participants in ecosystem-based management and monitoring. Here adaptive management can bring indigenous knowledge together with formal studies, the local communities and the land management agencies in a mix that may provide creative common-sense approaches to complicated problems.

Technical and scientific training of a local workforce should be an educational priority of the Adaptive Management Area Program. Formal schooling and field apprenticeship might provide the workforce needed to help implement ecosystem management, particularly in the area of monitoring. This program might be based on collaborations among local community colleges, state universities, and the agencies.

Descriptions of the Adaptive Management Areas

Adaptive Management Areas are shown on the Alternative 9 map that accompanies this Final SEIS. Adaptive Management Areas would contribute to accomplishing the objectives of the alternative, such as protection or enhancement of riparian habitat and provision for well-distributed late-successional forest habitat. Detailed prescriptions for achieving such objectives are not provided, however, in order to permit managers to develop and test alternative approaches applicable to their areas and in a manner consistent with existing environmental and other laws. Late-Successional Reserves within Adaptive Management Areas will be managed according to the standards and guidelines for such reserves except as provided elsewhere in this section. One hundred acres of the best northern spotted owl habitat will be retained as close to the nest site or owl activity center as possible for all known spotted owl activity centers in Adaptive Management Areas. Management of these areas will comply with the standards and guidelines for Late-Successional Reserves, and management around these areas will be designed to reduce risk of natural disturbances (see Appendix B11, Standards and Guidelines Resulting From Additional Species Analysis and Changes to Alternative 9).

Riparian protection in Adaptive Management Areas should be comparable to that prescribed for other federal land areas. For example, Key Watersheds with aquatic conservation emphasis within Adaptive Management Areas must have a full watershed analysis and initial Riparian Reserves comparable to those for Tier 1 Key Watersheds. Riparian objectives (in terms of ecological functions) in other portions of Adaptive Management Areas should have expectations comparable to Tier 2 Key Watersheds where applicable. However, flexibility is provided to achieve these conditions, if desired, in a manner different from that prescribed for other areas and to conduct bonafide research projects within riparian zones.

In summary, management activities in all the Adaptive Management Areas will be conducted to achieve the objectives described in the selected alternative. Standards and guidelines for Congressionally Reserved Areas or Late-Successional Reserves must be followed when they occur within Adaptive Management Areas, except that the Adaptive Management Area plans for the Finney and Northern Coast Adaptive Management Areas may change the Late-Successional Reserve designations in those areas. Flexibility is provided to meet objectives for Riparian Reserves and Key Watersheds. Full watershed analysis will be conducted prior to new management activities in identified Key Watersheds within Adaptive Management Areas. Standards and guidelines of current plans and draft plan preferred alternatives need to be considered during planning and implementation of activities within Adaptive Management Areas, and they may be modified in

Adaptive Management Area plans based on site-specific analysis. Otherwise, standards and guidelines are to be developed to meet the objectives of the Adaptive Management Area and the overall strategy. Coordination with the Regional Ecosystem Office is required.

Name:	**Applegate Adaptive Management Area, Oregon**
Size:	277,500 acres
Ownership:	Medford District Bureau of Land Management; Rogue River and Siskiyou National Forests; potentially state and private lands.
Associated Communities:	Grants Pass and Medford, Oregon; Jackson and Josephine Counties, Oregon; and Siskiyou County, California.
Emphasis:	Development and testing of forest management practices, including partial cutting, prescribed burning, and low impact approaches to forest harvest (e.g., aerial systems) that provide for a broad range of forest values, including late-successional forest and high quality riparian habitat. Late-Successional Reserves are included in the Adaptive Management Area boundaries.
Name:	**Blue River Adaptive Management Area, Oregon**
Size:	155,700 acres
Ownership:	Willamette National Forest; Eugene District Bureau of Land Management; potentially state and private lands.
Associated Communities:	Eugene, Springfield, and Sweet Home, Oregon.
Emphasis:	Intensive research on ecosystem and landscape processes and its application to forest management in experiments and demonstrations at the stand and watershed level; approaches for integrating forest and stream management objectives and on implications of natural disturbance regimes; and management of young and mature stands to accelerate development of late-successional conditions, a specific management objective for the forests within the Moose Lake block as well as in other portions of the Adaptive Management Area to be selected. Current status of the H. J. Andrews Experimental Forest as an Experimental Forest (i.e., maintenance of control areas and full flexibility to conduct experiments, is retained). One Late-Successional Reserve is included in the area.
Name:	**Cispus Adaptive Management Area, Washington**
Size:	143,900 acres
Ownership:	Gifford Pinchot National Forest; potentially state and private lands.
Associated Communities:	Randle, Morton, and Packwood, Washington; Lewis and Skamania Counties, Washington.
Emphasis:	Development and testing of innovative approaches at stand, landscape, and watershed level to integration of timber production with maintenance of late-successional forests, healthy riparian zones, and high quality recreational values.

Name: **Finney Adaptive Management Area, Washington**

Size: 98,400 acres
Ownership: Mt. Baker-Snoqualmie National Forest; potentially state and private lands.
Associated Communities: Darrington, Washington; Skagit and Snohomish Counties, Washington.
Emphasis: Restoration of late-successional and riparian habitat components. Because most late-successional forests have already been harvested, requirements for marbled murrelet include: (1) surveying for and protecting all occupied murrelet sites (see Alternative 1); (2) retaining LS/OG1s, LS/OG2s, and owl additions (from Johnson et al. 1991) as Late-Successional Reserves within the Adaptive Management Areas. These reserves should be managed as stipulated for such reserves under Alternative 9. However, because much of the Adaptive Management Area is Late-Successional Reserve, primarily designated for a single species about which information is still being developed, the designation and/or standards and guidelines for Late-Successional Reserves may be reconsidered in the Adaptive Management Area plan. Relaxation of the Late-Successional Reserve status is not necessarily assumed; proposals will require careful analysis to assure consistency with the Endangered Species Act and National Forest Management Act requirements, new marbled murrelet information, and overall objectives of the selected alternative. Sites occupied by spotted owls (pairs or territorial singles) will be protected by establishing Late-Successional Reserves using procedures to delineate Reserved Pair Areas under the Final Draft Spotted Owl Recovery Plan (USDI unpub., see Appendix B5, Recovery Plan Standards and Guidelines).

Name: **Goosenest Adaptive Management Area, California**

Size: 172,900 acres
Ownership: Klamath National Forest; potentially private lands.
Associated Communities: Yreka, Montague, Dorris, and Hornbrook California; Siskiyou County, California.
Emphasis: Development of ecosystem management approaches, including use of prescribed burning and other silvicultural techniques, for management of pine forests, including objectives related to forest health, production and maintenance of late-successional forest and riparian habitat, and commercial timber production.

Name: **Hayfork Adaptive Management Area, California**

Size: 488,500 acres
Ownership: Shasta-Trinity and Six Rivers National Forests and Yreka District Bureau of Land Management; potentially private and state lands.
Associated Communities: Hayfork, California; Trinity and Humboldt Counties, California.
Emphasis: Development, testing, and application of forest management practices, including partial cutting, prescribed burning, and low-impact approaches to

forest harvest, which provide for a broad range of forest values, including commercial timber production and provision of late-successional and high quality riparian habitat. Maintain identified Late-Successional Reserves; conduct full watershed analysis in critical watersheds.

Name: **Little River Adaptive Management Area, Oregon**

Size: 91,800 acres
Ownership: Umpqua National Forest and Roseburg District Bureau of Land Management; potentially private and state lands.
Associated Communities: Roseburg and Myrtle Creek, Oregon; Douglas County, Oregon.
Emphasis: Development and testing of approaches to integration of intensive timber production with restoration and maintenance of high quality riparian habitat.

Name: **Northern Coast Range Adaptive Management Area, Oregon**

Size: 250,000 acres
Ownership: Siuslaw National Forest and Salem District Bureau of Land Management; with potential participation by the Oregon Department of Forestry and private landowners.
Associated Communities: Tillamook, Willamina, and Grand Ronde, Oregon; Polk, Yamhill, Tillamook, and Washington Counties, Oregon.
Emphasis: Management for restoration and maintenance of late-successional forest habitat, consistent with marbled murrelet guidelines noted below. Conduct watershed analysis of the Nestucca River drainage. Subsequently, the Oregon Department of Forestry will be invited to collaborate in development of a comprehensive strategy for conservation of the fisheries and other elements of biological diversity in the northern Oregon Coast Ranges. Because most late-successional forests have already been harvested, requirements for marbled murrelet include: (1) surveying for and protecting all occupied murrelet sites (see Alternative 1); (2) retaining LS/OG1s, LS/OG2s, and owl additions (from Johnson et al. 1991) as Late-Successional Reserves within the Adaptive Management Areas. These reserves should be managed as stipulated for such reserves under Alternative 9. However, because much of the Adaptive Management Area is Late-Successional Reserve, primarily designated for a single species about which information is still being developed, the designation and/or standards and guidelines for Late-Successional Reserves may be reconsidered in the Adaptive Management Area plan. Relaxation of the Late-Successional Reserve status is not necessarily assumed; proposals will require careful analysis to assure consistency with the Endangered Species Act and National Forest Management Act requirements, new marbled murrelet information, and overall objectives of the selected alternative. In the interim, the maximum age for thinning within Late-Successional Reserves in this Adaptive Management Area is

110 years. Northern spotted owl sites will be protected by establishing Reserved Pair Areas under the Final Draft Spotted Owl Recovery Plan (USDI unpub., see Appendix B5, Recovery Plan Standards and Guidelines).

Name: **Olympic Adaptive Management Area, Washington**

Size: 150,400 acres
Ownership: Olympic National Forest and potentially Washington Department of Natural Resources, Indian Reservations, and private lands.
Associated Communities: Jefferson, Clallam, Grays Harbor, and Mason Counties, Washington.
Emphasis: Create a partnership with the Olympic State Experimental Forest established by Washington Department of Natural Resources. Develop and test innovative approaches at the stand and landscape level for integration of ecological and economic objectives, including restoration of structural complexity to simplified forests and streams and development of more diverse managed forests through appropriate silvicultural approaches such as long rotations and partial retention. All occupied marbled murrelet sites will be surveyed for and protected. LS/OG 1 and LS/OG 2 is to be managed as Late-Successional reserve except in the Quinault Special Management Area. The Quinault Special Management Area included within this Adaptive Management Area will continue to be managed in accordance with Public Law 100-638 which designated the area.

Name: **Snoqualmie Pass Adaptive Management Area, Washington**

Size: 212,700 acres
Ownership: Wenatchee and Mt. Baker-Snoqualmie National Forests; Plum Creek Timber Company and other private landowners; state.
Associated Communities: Cle Elum and Roslyn, Washington; Kittitas and King Counties, Washington.
Emphasis: Development and implementation, with the participation of the U.S. Fish and Wildlife Service, of a scientifically credible, comprehensive plan for providing late-successional forest on the "checkerboard" lands. This plan should recognize the area as a critical connective link in north-south movement of organisms in the Cascade Range.

Appendix B4
Protection Buffers

Protection buffers are additional standards and guidelines for specific rare and locally endemic species, and other specific species in the upland forest matrix, from the Scientific Analysis Team Report (Thomas et al. 1993).

The Forest Service's Scientific Analysis Team (SAT) examined the effects of Forest Plans and the Interagency Scientific Committee (ISC) Conservation Strategy on the amount and distribution of habitat to support the viability of species other than the northern spotted owl associated with late-successional forests on lands administered by the Forest Service. The Scientific Analysis Team determined that these plans would not provide and manage habitat to achieve at least a medium-high likelihood of supporting a stable population of all such species and proposed a series of mitigation steps to be applied to Forest Plans. Those mitigation recommendations were reexamined by the Forest Ecosystem Management Assessment Team and incorporated, as appropriate, into the action alternatives. Two of the mitigation steps recommended by the Scientific Analysis Team provided specific standards and guidelines for survey and protection of rare and locally endemic species, and for other species in the upland forests. These standards and guidelines would be applied wherever the species occurs outside of designated areas. The Assessment Team applied these, as written by the Scientific Analysis Team, to Alternatives 1, 3, 4, 5, and, with the exception of those pertaining to American marten, Alternative 9. The standards and guidelines apply to the lands administered by the Forest Service and BLM.

Some of the mitigation steps would create additional Late-Successional Reserves, some would create additional Managed Late-Successional Areas, and others would add additional matrix standards and guidelines. The following table identifies mitigation steps as described in the SAT Report that create

[Insert **PLACEHOLDER Table B4-1. HALF PAGE**]

Late-Successional Reserves and Managed Late-Successional Areas, and that add additional matrix standards and guidelines.

These recommendations, from Thomas et al. (1993) pages 291-299, are as follows:

SAT Mitigation Step 5: Standards and Guidelines for Rare and Locally Endemic Species

The following rare and locally endemic species are likely to be assured viability if they occur within Habitat Conservation Areas. However, there might be occupied locations outside these areas that will be important to protect as well. [The Scientific Analysis Team] therefore recommend[s] that protocols for surveys be developed that will ensure a high likelihood of locating these occupied sites. Prior to ground-disturbing activities, surveys using the protocol must be conducted within the known or suspected ranges and within the habitat types or vegetation communities occupied by the species. When located, the occupied sites need to be protected as indicated below.

(1) Nonvascular Plants:

(a) *Ptilidium californicum* (Liverwort) - This species is rare and has a very limited distribution in old white fir forests with fallen trees. It occurs on trunks of trees at about 5000-feet elevation. Mitigation options include finding locations and maintaining stands of overmature white fir at about 5000-feet elevation for inoculum and dispersal along corridors; and studying specific distribution patterns. Protect known occupied locations if distribution patterns are disjunct and highly localized, by deferring timber harvest and avoiding removal of fallen trees and logs.

(b) *Ulota meglospora* (Moss) - This species occurs in northern California and southwest Oregon. It is best developed (locally abundant) in very old stands of tanoak, Douglas-fir, and other conifer species further north, but is generally scarce throughout its range. The species is poorly known ecologically. Mitigation activities include conducting basic ecological studies, and surveying for presence, particularly in Oregon. Protect known occupied sites if distribution patterns are disjunct and highly localized. Defer timber harvest or other activities which would not maintain desired habitat characteristics and population levels.

(c) *Brotherella roellii* (Moss) - This very rare species is endemic to the Washington Cascades north of Snoqualmie Pass. It occupies rotting logs in low to mid-elevation old-growth stands having dense shade, closed canopies, and high humidity. Mitigation options include locating specific populations and protection of large decay class 3, 4, and 5 logs and >70 percent canopy closure. Defer management activities conflicting with maintaining suitable habitat characteristics and known populations levels.

(d) *Buxbaumia piperi, B. viridis, Rhizomnium nudum, Schistostega pennata,* and *Tetraphis geniculata* (Mosses) - Most of these species are fairly rare (the exception is *B. piperi*). They occur on rotten logs and some organic soil, and are shade-dependent, occurring in old-growth forests. *S. pennata* occurs only in mature western red-cedar forests in the Olympic National Forest and in [the] Washington Cascades. Mitigation activities include surveying to determine presence and distribution; and, where located, maintaining decay class 3, 4, and 5 logs and >70 percent closed-canopy forest habitats for shade. Shelterwood and thinning prescriptions for timber harvest will cause their demise, as logs dry out.

(e) *Aleuria rhenana* (Fungus) - This mushroom is widely distributed but rare and little known throughout its range, known from one collection from Mt. Rainier National Park. It is a conifer litter decomposer. Mitigation activities include conducting ecological studies and surveys to determine localities. Protect known populations if surveys continue to indicate that the population is rare. Defer ground-disturbing activities.

(f) *Otidea leporina, O. onotica,* and *O.smithii* (Fungi) - These mushrooms occur in conifer duff, and are widespread in distribution but uncommon. They are dependent on older-age forests. Specific mitigation options include protecting older forests from ground disturbance where the species are located.

(g) *Polyozellus multiplex* (Fungus) - Ecologically, this mushroom was considered by the nonvascular expert panel in the same species group as *Albatrellus caeryliopus* and others, listed [earlier in the SAT Report] under species aided by marbled murrelet mitigation measures. However, *P. multiplex* occurs in higher elevation[s] of the Cascades in silver fir and mixed conifer (and is thus outside the range of marbled murrelet mitigations). It can be locally abundant and is a mycorrhizal species important to forest health. Like its group associates, it is a good indicator of old-growth forests. Mitigation activities for this species include conducting surveys to define its distribution, and studies to assess its habitat requirements.

(h) *Sarcosoma mexicana* (Fungus) - This mushroom occurs in deep conifer litter layers in older forests. It is uncommon to rare and is found in the Oregon and Washington Coast Range into British Columbia. Mitigation activities include surveying for locations and protecting deep litter layers of older forests where found. Defer prescribed burning of understory or other activities which would not retain a deep litter layer.

For all of the plants listed in this mitigation step, and for those listed in the next step, [the Scientific Analysis Team] recommend[s] that Regional ecologists or botanists should: (1) maintain a spatially explicit data base of all known sites in National Forests, and (2) develop species or area management plans, to be implemented under the guidance of the regional botany programs.

(2) Invertebrates:

Although lack of information prevented analyzing mitigation needs for specific invertebrate species, Olson (1992) underscored the need for surveys for species that are rare or locally endemic. Within the range of the northern spotted owl, invertebrates are noted for their high frequency of endemism (species found nowhere else) and restricted ranges (Lattin 1993). Centers of invertebrate biodiversity include, in particular, the Olympic Peninsula and its south coast, the southern Oregon Cascades, the Klamath Physiographic Province, several isolated volcanic peaks including Mt. Hood and The Three Sisters in the Oregon Cascades, and the coastal forests of Oregon and California (Lattin 1993). In addition, some species are poor dispersers or rely on special habitats including decaying wood or aquatic environments (Lattin and Moldenke 1992).

Frest and Johannes (1991) identified endemic species complexes of terrestrial mollusks (bivalves and snails) in the west coast states, particularly limited to the areas from the Cascades crest to the coast. As summarized by Anthony et al. (1992:348-349) [USDI 1992],

> "Within the owl's range, there are three distinct land snail provinces. The Oregon province extends from coastal British Columbia just into extreme northern California; the Washington province extends east from the Cascades crest; and the California province is coastal from northern California.
>
> "There are sizable endemic species clusters in the land snail genera *Monadenia, Trilobopsis, Megomphix, Haplotrema, Vespericola* and *Hemphillia*. Physical factors limiting their distribution include geologic history, substrate (some are restricted to limestone, e.g., the candidate *Monadenia troglodytes*, endemic to the Siskiyou Mountains and the area around Mt. Shasta), moisture requirements, and cover. In general, land snails in this region require relatively undisturbed cover. Most thrive in lowland forests and the areas around springs. Many species seem to be associated specifically with lowland old-growth forests, and most are extremely limited in distribution. The malone jumping slug, *Hemphillia malonei*, occurs only on the slopes of Mt. Hood. The genus *Megomphix* is known only from sites in the Puget Sound region and in the Willapa Hills, of southwest Washington. In recent years, only one site has been found to support *Megomphix hemphilli*."

Frest and Johannes (1991) also identified complexes of endemic freshwater mollusks, although the aquatic complexes are not part of [the Scientific Analysis Team's] current analysis.

Anthony et al. (1992:355-356) also discussed the occurrence and distribution of arthropods in old-growth forests of the Pacific Northwest:

> "First, many species are flightless, which means that their dispersal capabilities are limited. Second, the flightless condition is believed to reflect habitat stability and permanence over a long time period. Some old forest associates have highly disjunct distributions and are found chiefly in undisturbed forests. They share similar distribution patterns on the west side of the Cascade Mountains from British Columbia south to southern Oregon and northern California (i.e., they are endemic to the Pacific Northwest). Many of the species native to this region have not been described or named. The number of known species probably represents less than half of the estimated species" (Lattin, J. pers. comm.).

Mitigation guidelines for Riparian Habitat Conservation Areas and marbled murrelets would aid in conserving species in biodiversity centers and other areas, as "Habitat Conservation Areas established for owls probably will not capture the full extent of invertebrate species richness. The protection of suitable owl habitat in intervening areas as proposed in Alternative D of the Final Environmental Impact Statement [USDA FS 1992a] will help preserve more species distributed over the landscape, but the effectiveness of this provision will be dependent upon the number, size, and isolation of the selected habitat fragments" (Olson 1992:4-5).

Olson (1992) also noted that small fragments of primary forest might serve as reserves for populations of old-growth invertebrates. "In regions with a high proportion of species with restricted ranges, such as the Olympic Peninsula, the coastal forest of Washington, Oregon, and California, and the Klamath Province, increased emphasis on preserving small fragments of [old-growth forest] habitat may be warranted" (Olson 1992:15). Such fragments would be provided under a combination of the Riparian Habitat Conservation Areas and marbled murrelet guidelines. Elsewhere, some species of invertebrates can be provided for by retaining canopy coverage, providing log and slash piles, and maintaining a moist forest floor environment (Lattin and Moldenke 1992).

Understanding the true effectiveness of conserving the invertebrate fauna with mitigation measures proposed in [the Scientific Analysis Team's] report awaits further surveys, inventories, and studies (Lattin 1993). Olson (1992:12) proposed using a survey protocol for rapidly identifying biologically unique areas, and in taking advantage of "natural experiments" to investigate the relationships of invertebrate populations to different growth stages and variously fragmented forest patches and landscapes. He presented an excellent research agenda for such studies (too lengthy to repeat [in the Scientific Analysis Team Report]), which included testing and use of invertebrate species as environmental indicators. This agenda should be pursued.

(3) Amphibians:

(a) Larch Mountain Salamander - Because of the narrow distribution of this species, mostly within the Columbia River Gorge, primary emphasis should be to survey and protect all known sites. Sites must be identified based on fall surveys conducted using a standardized protocol. Known sites are included within boundaries of conservation areas and under these guidelines, are not to be disturbed. Surveys are needed at additional sites in the forest matrix along the Columbia River Gorge. Key habitat is mossy talus protected by overstory canopy. Avoiding any ground-disturbing activity that would disrupt the talus layer where this species occurs is the primary means of protection. Once sites are identified, maintain 40 percent canopy closure of trees within the site and within a buffer of at least the height of one site-potential tree or 100 feet horizontal distance, whichever is greater, surrounding the site. Larger buffer widths are appropriate upslope from protected sites on steep slopes. Partial harvest may be possible if canopy closure can be retained; in such cases logging must be conducted using helicopters or high-lead cable systems to avoid disturbance of the talus layer.

(b) Siskiyou Mountain Salamander - this species occurs within an extremely narrow range on the Rogue River, Siskiyou, and Klamath National Forests. Its range does not fall within any Habitat Conservation Areas in Oregon. Additional surveys conducted using a standardized protocol must be undertaken to delineate range and identify subpopulations. All populations must be protected by delineating an occupied site and avoiding disturbance of talus throughout the site, especially on moist, north-facing slopes, particularly in Oregon where Habitat Conservation Areas do not incorporate species' range. Because this species seems to require cool, moist conditions, a buffer of at least the height of one site-potential tree or 100 feet horizontal distance, whichever is greater, surrounding the site, must be retained around the outer periphery of known sites. Overstory trees must not be removed within the boundary of this buffer.

(c) Shasta Salamander - This species is very narrowly distributed, occurring only in localized populations on the Shasta-Trinity National Forest. Only a small part of its range is included within a Habitat Conservation Area under Alternative B [Forest Plans plus ISC Conservation Strategy in the FEIS, USDA FS 1992a]. It occurs in association with limestone outcrops, protected by an overstory canopy. All known and future localities must be delineated and protected from timber harvest, mining, quarry activity, and road building within the delineated site, and a buffer of at least the height of one site-potential tree or 100 feet horizontal distance, whichever is greater, should surround the outcrop. Additional surveys, conducted using a standardized protocol, must be undertaken to identify and delineate all occupied sites within the species' potential range.

SAT Mitigation Step 6: Additional Standards and Guidelines for Other Species in the Upland Forest Matrix

As with the above sets of species under Mitigation Step 5, the following species whose viability is considered to be at risk under Alternative B [Forest Plans plus ISC Conservation Strategy in USDA FS 1992a] of the Final Environmental Impact Statement are likely to be assured viability if they occur within Habitat Conservation Areas of Alternative B of the Final Environmental Impact Statement, Riparian Habitat Conservation Areas, or areas covered under the marbled murrelet guidelines. However, if they are located outside of such areas, additional mitigation measures would be needed to avoid increasing risk to viability. These measures are discussed, by species, below.

(1) Amphibians:

Del Norte Salamander - This species occurs in talus slopes protected by overstory canopy that maintains cool, moist conditions on the ground. The species is a slope-valley inhabitant, and sometimes occurs in high numbers near riparian areas. Riparian Habitat Conservation Areas, in combination with Habitat Conservation Areas and other reserves, will offer some protection to the species but significant numbers also occur in upland areas. Additional mitigation options in this upland matrix include identifying locations (talus areas inhabited by the species) by using a standardized survey protocol, then protecting the location from ground-disturbing activities. Designate a buffer of at least the height of one site-potential tree or 100-feet horizontal distance, whichever is greater, surrounding the location. Within the site and its surrounding buffer, maintain 40 percent canopy closure and avoid any activities that would directly disrupt the surface talus layer. Partial harvest within the buffer may be possible if 40 percent canopy closure can be maintained; in such cases, tree harvest must be conducted using helicopters or high lead cable systems to avoid compaction or other disturbance of talus.

(2) Birds:

(a) White-headed Woodpecker, Black-backed Woodpecker, Pygmy Nuthatch, and Flammulated Owl - These species will not be sufficiently aided by application of mitigation measures for riparian habitat protection or for marbled murrelets alone. They all occur on the periphery of the range of the northern spotted owl on the east slope of the Cascade Range in Washington or Oregon. Additionally, [the] white-headed woodpecker and flammulated owl occur in the Klamath Province in northwestern California and southwestern Oregon. The viability of all four species within the range of the northern spotted owl was rated as a medium risk on National Forests, although they each are much more widely distributed elsewhere.

Apply the following mitigation guidelines to ensure that the distribution and numbers of all four species do not severely decline on National Forests within the range of the northern spotted owl. These guidelines apply to the forest matrix outside designated habitat for the northern spotted owl and Riparian Habitat Conservation Areas. Maintain adequate numbers of large snags and green tree replacements for future snags within the four species' ranges in appropriate forest types. Where feasible , green tree replacements for future snags can be left in groups to reduce blowdown. Specifically, [the Scientific Analysis Team] recommend[s] that no snags over 20 inches dbh be marked for cutting. [The Scientific Analysis Team] recognize[s], however, that safety considerations may prevent always retaining all snags. Use of standardized definitions of hazard trees is required. For the longer term, provide for sufficient numbers of green trees to provide for the full (100 percent) population potential of each species.

As depicted by Neitro et al. (1985), the 100 percent population potential for white-headed woodpeckers is 0.60 conifer snags (ponderosa pine of Douglas-fir) per acre in forest habitats; these snags must be at least 15 inches dbh (or largest available if 15 inch dbh snags are not available) and in soft decay stages (see Neitro et al. 1985 for specifics), and must be provided in stands of ponderosa pine and mixed pine-Douglas-fir. The 100 percent population potential for black-backed woodpeckers is 0.12 conifer snags per acre in forest habitats; these snags must be at least 17 inches dbh (or largest available if 17 inch dbh snags are not available) and in hard decay stages, and must be provided in stands of mixed conifer and lodgepole pine in higher elevations of the Cascade Range. Provision of snags for other cavity-nesting species, including primary cavity-nesters, must be added to the requirements for these two woodpecker species. Site-specific analyses, and application of a snag recruitment model (specifically, the Forest Service's Snag Recruitment Simulator) taking into account tree species, diameters, falling rates, and decay rates, will be required to determine appropriate tree and snag species mixes and densities. If snag requirements cannot be met, then harvest must not take place.

As identified by the expert panel, black-backed woodpeckers also require beetle infested trees for foraging; some such trees should be provided in appropriated habitat, and sanitation harvest of all such trees would be detrimental to the species. More information is needed on habitat use, seasonal occurrence, and use of forest age classes and burns, for the black-backed woodpecker.

Pygmy nuthatches use habitat very similar to those of white-headed woodpeckers. Pygmy nuthatches require large trees, typically ponderosa pine within the range of the northern spotted owl, for roosting. Provision of snags for white-headed woodpeckers is assumed to provide for the needs of pygmy nuthatch, as no species-specific guidelines for the species have been developed. Additional information on ecology of pygmy nuthatch within the range of the northern spotted owl is needed to develop more precise guidelines.

Flammulated owls are secondary cavity-nesters and use cavities, in snags and live trees, created by woodpeckers or, less often, that occur naturally. [The Scientific Analysis Team] assume[s] that standards and guidelines for snags and green tree replacements for woodpeckers and other primary cavity-nesting species, as provided by existing National Forest Land and Resource Management Plans and for the woodpeckers in this species group, would provide for flammulated owls.

[Note: The snag recommendations above are based on the model of Neitro et al. (1985). In that model, snag requirements for individual species were treated as additive in developing snag requirements for the overall community of cavity excavators. As noted above, "provision of snags for other cavity-nesting species, including primary cavity nesters, must be added to the requirements for these two woodpecker species" (black-backed and white headed woodpeckers).

Snag requirements are developed by the National Forests and BLM Districts for specific forest cover types, and these may be further broken down by geographic location. The intent is to tailor the requirements to those species that are actually expected to occur in an area. To determine if the protection buffer requirements should be added to existing Forest or BLM District Plan requirements, the basis for those existing requirements should be analyzed to determine if they include the species identified by SAT at the specified level of percent population potential. If they do not, then the SAT requirements must be added to the existing Forest and BLM District Plan requirements.]

(b) Great Gray Owl - Within the range of the northern spotted owl, the great gray owl is most common in lodgepole pine forests adjacent to meadows. However, it is also found in other coniferous forest types. In some locations, such as on the Willamette National Forest west of the Cascades Crest, at least some shelterwood harvesting seems to be beneficial for the species by opening up otherwise closed canopy cover for foraging. In doing so, consequences to species such as northern goshawk and American marten must be evaluated. Specific mitigation measures for great gray owl, within the range of the northern spotted owl, include the following: provide a no-harvest buffer of 300 feet around meadows and natural openings and establish 1/4-mile protection zones around known nest sites. Within one year, develop and implement a standardized protocol for surveys; survey for nest locations using the protocol. Protect all future discovered nest sites as previously described.

(3) Mammals:

(a) American Marten and Fisher - The level of habitat conservation provided by the combination of Alternative B [Forest Plans plus ISC Conservation Strategy] of the Final Environmental Impact Statement [USDA FS 1992a], Riparian Habitat Conservation Areas, and marbled murrelet mitigation guidelines are generally sufficient so that additional standards and guidelines are not required to prevent the extirpation of American martens and fishers within the range of the northern spotted owl. However, [the Scientific Analysis Team] do[es] recommend two additional actions for specific areas to help ensure future viability of these species.

First, the National Forests in California must finalize and implement their draft habitat capability model for fisher and American marten. Implementation of this model would likely [produce] information that will further reduce risks to viability in those National Forests. Forests in Oregon and Washington must retain existing management requirement areas for American marten for the same reason. However, adequacy of these practices must be reevaluated through the ongoing conservation assessment process or through special review. Monitoring and adaptive management are especially important for these species.

Second, populations of fishers are extremely low in northern Oregon and Washington. Harvest of American martens is permitted in these states, and accidental take of fishers cannot be avoided using kill-trap methods. To reduce risk of further loss of fishers, [the Scientific Analysis Team] recommend[s] closure of all National Forests (within the overlapping ranges of American marten, fisher, and northern spotted owls) to kill-trapping of American martens until the rate of accidental take of fishers is determined to be insignificant. [The Scientific Analysis Team] recommend[s] formation of an interagency group comprised of state furbearer biologists and Forest Service wildlife biologists to undertake this evaluation for both states.

(b) Lynx - Lynx are rare within the range of the northern spotted owl, occurring primarily in the Okanogan area of Washington. The lynx is currently listed by the Fish and Wildlife Service as a Category 2 candidate (a species for which additional information is needed to propose listing as threatened or endangered). A petition was filed to list the lynx as endangered within the northern Cascades of Washington, based on small population size, population isolation, and lack of adequate prey base (snowshoe hare). However, the Fish and Wildlife Service ruled that available information does not warrant listing the lynx in Washington (USDI FWS 1992).

Three primary habitat components for lynx are (1) foraging habitat (15-35 year old lodgepole pine) to support snowshoe hare and provide hunting cover, (2) denning sites (patches of >200-year old spruce and fir, generally <5 acres), and (3) dispersal/travel cover (variable in vegetation composition and structure). The major limiting factor is abundance of snowshoe hare, which in turn is limited by availability of winter habitat (primarily early-successional lodgepole pine with trees at least 6 feet tall). Past excessive trapping of lynx and incidental mortality of lynx from hunting of other species have depressed populations and may have been detrimental to local lynx populations in Washington (Wash. Dept. of Wildlife 1991). Roads provide access to hunters and trappers and thus road density may be related to lynx mortality.

Alternative B as described in the Final Environmental Impact Statement [USDA FS 1992a], as well as existing higher elevation reserves, will provide denning habitat within protected forest stands in juxtaposition with early successional vegetation in the forest matrix. Connectivity between many of the denning patches will be provided by the network of buffers along streams under the Riparian Habitat Conservation Areas.

In addition, [the Scientific Analysis Team] propose[s] development of site-specific timber harvest, roading, and fire management plans in known lynx range. These plans should be developed in consultation with state wildlife agencies and should address: (1) minimizing road construction, closing unused roads, and maintaining roads to the minimum standard possible; (2) using prescribed fire to maintain forage for snowshoe hare in juxtaposition with hunting cover; (3) designating areas as closed to kill trapping of any furbearer to avoid incidental lynx mortality to maintain population refugia for lynx in key areas; (4) planning for kill trapping closure on a wider basis if data indicate a declining lynx population as a result of incidental trapping mortality; and (5) developing and implementing a credible survey and monitoring strategy to determine the distribution of lynx throughout its potential range.

Appendix B5
Recovery Plan Standards and Guidelines

These guidelines are adapted from the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.). Some or all of these guidelines are applied in Alternatives 2 through 10. See the individual alternative descriptions in Chapter 2 for specific application of these guidelines.

Guidelines for Silvicultural Activities and Salvage in Late-Successional Reserves and Managed Late-Successional Areas

Guidelines for Silviculture

The primary objective of silvicultural activities in Late-Successional Reserves is to improve habitat in younger stands. Consequently, activities are encouraged if empirical information and modeling indicate that the development of late-successional habitat conditions will be accelerated. Interdisciplinary teams of wildlife biologists, silviculturists, and other specialists are encouraged to develop prescriptions that meet these criteria. General guidelines for silvicultural activities follow.

1. To safeguard the conservation benefits of Late-Successional Reserves, silvicultural activities should be directed at young stands where stocking, structure, or composition are expected to prevent or significantly retard development of late-successional conditions. This will generally include stands that: are composed of trees less than 10 to 12 inches dbh, show no significant development of a multiple-canopy tree structure, and were regenerated following harvest activity. There will be exceptions to these guidelines, and judgments on stands to be managed will vary according to forest type and stand history. Activities in other types of stands that do not meet the general guidelines can be considered, particularly where those stands are heavily stocked and not being used by spotted owls or other late-successional associates. Examples may include stands that were planted following catastrophic fires or stands previously dominated by conifers that converted to hardwoods following harvest. Stands that have desired late-successional structure or that will soon develop it should not be treated unless such treatment is necessary to accomplish risk-reduction objectives (as described below).

2. Prescriptions to be used for each stand should be well thought out and documented. They will be designed to produce stand structure and components associated with late-successional conditions. These components include large trees, snags, logs, and dense, multistoried canopies. Prescriptions should show the treatments to be applied and the anticipated effects on the stand over time. They should also include a discussion of the actions, coordination efforts, and review that will be necessary for successful implementation. This discussion should draw on previous efforts made to implement similar prescriptions. Finally, the prescriptions should identify key stand attributes or accomplishments that should be monitored. For example, if snags are to be created, or regeneration established, the accomplishment of these actions and their results should be monitored.

3. Silvicultural activities must maintain or reduce risk of large-scale natural disturbance. For example, activities should not be implemented if they significantly increase the risk of windthrow in a stand.

4. To promote late-successional structure in stands to be thinned, prescriptions will provide for leaving some trees as snags and others as down wood. Those trees not needed for habitat development may be removed for commercial or fuel hazard reasons.

5. Key attributes of late-successional forests are their diversity and variability on individual sites and from site to site. To promote diversity and variability, a wide range of silvicultural practices should be applied, as opposed to reliance on a limited variety of techniques.

6. Activities that comply with these guidelines should provide positive conservation benefits. Actual implementation experience, however, is not extensive. A modest rate of implementation is prudent and will provide the opportunity to assess and refine activities. Acreage to be manipulated by silvicultural activities should generally be limited to 5 percent of the total area in any Late-Successional Reserve in the initial 5-year period of implementation, unless the need for larger-scale actions explicitly are justified.

7. Some habitat modification activities in Late-Successional Reserves will generate enough revenue to pay for themselves. Others will not and need to be supported by appropriated funds. It is not appropriate to conduct only those activities that generate a commercial return and ignore the needs of stands that cannot be treated commercially.

Guidelines to Reduce Risks of Large-Scale Disturbance

Large-scale disturbances are natural events, such as fire, that can eliminate owl habitat on hundreds or thousands of acres. Certain risk management activities, if properly planned and implemented, may reduce the probability of these major stand-replacing events. There is considerable risk of such events in Late-Successional Reserves in the Washington and Oregon Eastern Cascades, and California Cascades Provinces and a lesser risk in the Oregon and California Klamath Provinces. Elevated risk levels are attributed to changes in the characteristics and distribution of the mixed-conifer forests resulting from past fire protection. These forests occur in drier environments, have had repeated insect infestations, and are susceptible to major fires. Risk reduction efforts are encouraged where they are consistent with the overall recommendations in this section of Appendix B5.

Silvicultural activities aimed at reducing risk shall focus on younger stands in Late-Successional Reserves. The objective will be to accelerate development of late-successional conditions while making the future stand less susceptible to natural disturbances. Salvage activities should focus on the reduction of catastrophic insect, disease, and fire threats. Treatments should be designed to provide effective fuel breaks wherever possible. However, the scale of salvage and other treatments should not generally result in degeneration of currently suitable owl habitat or other late-successional conditions.

In some Late-Successional Reserves in these provinces, management that goes beyond these guidelines may be considered. Levels of risk in those Late-Successional Reserves are particularly high and may require additional measures. Consequently, management activities designed to reduce risk levels are encouraged in those Late-Successional Reserves even if a portion of the activities must take place in currently late-successional habitat. While risk-reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if: (1) the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat, (2) the activities are clearly needed to reduce risks, and (3) the activities will not prevent the Late-Successional Reserves from playing an effective role in the objectives for which they were established.
Such activities in older stands may also be undertaken in Late-Successional Reserves in other

provinces if levels of fire risk are particularly high. These activities are subject to review by the Regional Ecosystem Office. The Regional Ecosystem Office may develop criteria that would exempt some activities from review.

Guidelines for Salvage

Salvage is defined as the removal of trees from an area following a stand-replacing event caused by wind, fires, insect infestations, volcanic eruptions, or diseases. Salvage guidelines are intended to prevent negative effects on late-successional habitat, while permitting some commercial wood volume removal. In some cases, salvage operations may actually facilitate habitat recovery. For example, excessive amounts of coarse woody debris may interfere with stand regeneration activities following some disturbances. In other cases, salvage may help reduce the risk of future stand-replacing disturbances. While priority should be given to salvage in areas where it will have a positive effect on late-successional forest habitat, salvage operations should not diminish habitat suitability now or in the future.

Tree mortality is a natural process in a forest ecosystem. Diseased and damaged trees are key structural components of late-successional forests. Accordingly, management planning for Late-Successional Reserves must acknowledge the considerable value of retaining dead and dying trees in the forest as well as the benefits from salvage activities.

In all cases, planning for salvage should focus on long-range objectives, which are based on desired future condition of the forest. Since Late-Successional Reserves have been established to provide high quality habitat for species associated with late-successional forest conditions, management following a stand-replacing event should be designed to accelerate or not impede the development of those conditions. The rate of development of this habitat will vary among provinces and forest types and will be influenced by a complex interaction of stand-level factors that include site productivity, population dynamics of live trees and snags, and decay rates of coarse woody debris. Because there is much to learn about the development of species associated with these forests and their habitat, it seems prudent to only allow removal of conservative quantities of salvage material from Late-Successional Reserves and retain management opportunities until the process is better understood.

The following guidelines are general. Specific guidelines should be developed for each physiographic province, and possibly for different forest types within provinces.

1. The potential for benefit to species associated with late-successional forest conditions from salvage is greatest when stand-replacing events are involved. Salvage in disturbed sites of less than one acre (some alternatives specify 10 or 100 acres) is not appropriate because small forest openings are an important component of old-growth forests. In addition, salvage should occur only in stands where disturbance has reduced canopy closure to less than 40 percent, because stands with more closure are likely to provide some value for species associated with these forests.

2. Surviving trees will provide a significant residual of larger trees in the developing stand. In addition, defects caused by fire in residual trees may accelerate development of structural characteristics suitable for associated species. Also, those damaged trees that eventually die will provide additional snags. Consequently, all standing live trees should be retained, including those injured (e.g., scorched) but likely to survive. Inspection of the cambium layer can provide an indication of potential tree mortality.

3. Snags provide a variety of habitat benefits for a variety of wildlife species associated with late-successional forests. Accordingly, following stand-replacing disturbance, management should focus on retaining snags that are likely to persist until late-successional conditions have developed and the new stand is again producing large snags. Late-successional conditions are not associated with stands less than 80 years old.

4. Following a stand-replacing disturbance, management should retain adequate coarse woody debris quantities in the new stand so that in the future it will still contain amounts similar to naturally regenerated stands. The analysis that determines the amount of coarse woody debris to leave must account for the full period of time before the new stand begins to contribute coarse woody debris. As in the case of snags, province-level specifications must be provided for this guideline. Since coarse woody debris decay rates, forest dynamics, and site productivity undoubtedly will vary among provinces and forest types; the specifications also will vary.

   Watershed-level or province-level plans will establish appropriate levels of coarse woody debris and decay rates to be used. Levels will be "typical" and will not require retention of all material where it is highly concentrated, or too small to contribute to coarse woody debris over the long timeframes discussed. This standard and guideline represents one item to be considered and may indeed result in no salvage following windthrow in low density stands. As for other management activities, it is expected that salvage standards and guidelines will be refined through the implementation process and adaptive management.

5. Some salvage that does not meet the preceding guidelines will be allowed when salvage is essential to reduce the future risk of fire or insect damage to late-successional forest conditions. This circumstance is most likely to occur in the eastern Oregon Cascades, eastern Washington Cascades, and California Cascades Provinces, and somewhat less likely to occur in the Oregon Klamath and California Klamath Provinces. It is important to understand that some risk associated with fire and insects is acceptable because they are natural forces influencing late-successional forest development. Consequently, salvage to reduce such risks should focus only on those areas where there is high risk of large scale disturbance.

6. Removal of snags and logs may be necessary to reduce hazards to humans along roads and trails, and in or adjacent to campgrounds. Where materials must be removed from the site, as in a campground, a salvage sale is appropriate. In other areas, such as along roads, leaving material on site should be considered. Also, material will be left where available coarse woody debris is inadequate.

7. Where green trees, snags, and logs are present following disturbance, the green tree and snag guidelines will be applied first, and completely satisfied where possible. The biomass left in snags can be credited toward the amount of coarse woody debris biomass needed to achieve management objectives.

8. These basic guidelines may not be applicable after disturbances in younger stands since remnant coarse woody debris may be relatively small. In these cases, diameter and biomass retention guidelines should be developed consistent with the intention of regenerating late-successional forest conditions.

9. Logs present on the forest floor before a disturbance event provide habitat benefits that are likely to continue. It seldom will be appropriate to remove them. Where these logs are in an advanced state of decay, they will not be credited toward objectives for coarse woody debris retention developed after a disturbance event. Advanced state of decay should be defined as logs not expected to persist to the time when the new stand begins producing coarse woody debris.

10. The coarse woody debris retained should approximate the species composition of the original stand to help replicate preexisting suitable habitat conditions.

11. Some deviation from these general guidelines may be allowed to provide reasonable access to salvage sites and feasible logging operations. Such deviation should occur on as small a portion of the area as possible, and should not result in violation of the basic intent that late-successional forest habitat or the development of such habitat in the future should not be impaired throughout the area. While exceptions to the guidelines may be allowed to provide access and operability, some salvage opportunities will undoubtedly be foregone because of access, feasibility, and safety concerns.

Delineation and Management of Reserved Pair Areas

1. For each Reserved Pair Area, delineate an area surrounding the owl activity center with an acreage at least equal to the median home range size for pairs in that province. Use data from the spotted owl study area that is most similar to the site being considered (Table B5-1). This area will be delineated to encompass as much suitable habitat as possible, and the habitat will be as close to the owl activity center as possible. Reserve all suitable habitat in that area from timber harvest. If the habitat acreage does not at least equal the median amount found for owl pairs in the province, additional habitat must be provided from the next best habitat available in the home range area, or by expanding the area to incorporate additional suitable habitat. Use logical physical boundaries to facilitate management of the area. Late-Successional Reserve management standards and guidelines for salvage and other multiple-use activities would generally apply in the suitable habitat portion of the Reserved Pair Area.

2. In the Reserved Pair Areas, allow for management of currently unsuitable areas consistent with Late-Successional Reserve management standards and guidelines for silviculture and salvage. Management of other multiple-use activities in the unsuitable habitat should follow guidance from agency planning documents, which may allow some activities that would not be consistent with Late-Successional Reserve management standards and guidelines.

Delineation and Management of Managed Pair Areas

1. For each Managed Pair Area, delineate an area surrounding the owl activity center with an acreage at least equal to the median home range size for pairs. The size of this area will be determined from median home range data for the province (Table B5-1). Use data from the spotted owl study area that is most similar to the site being considered. The delineated area should be configured so that it contains an amount of suitable habitat that approximates at least the median amount observed in pair home ranges for the province (Table B5-2).

2. Suitable habitat should be maintained through time using various management techniques. The objective will be to always maintain an amount of suitable habitat equal to median amounts observed in pair home ranges in the province. The location of this acreage may change through time as management is rotated through the area. Some uncertainty will be accepted in management to provide habitat in these areas.

3. Silviculture, salvage, and other multiple-use activities for these areas always should be guided by the objective of maintaining adequate amounts of suitable habitat.

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Appendix B6

Aquatic Conservation Strategy

(NOTE: Ther e are some significant differences between the following text and the printed FSEIS!)

The Aquatic Conservation Strategy was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on all public lands. The strategy would protect salmon and steelhead habitat on public lands including those managed by the Forest Service, Bureau of Land Management, Park Service, within the range of Pacific Ocean anadromy. It is a refinement of the approach outlined in Appendix 5-K of the Scientific Analysis Team Report (Thomas et al. 1993). The following description of the strategy, its components, objectives, and applicable standards and guidelines is adapted from Chapter V, Aquatic Ecosystem Assessment, of the Forest Ecosystem Management Assessment Team's (FEMAT) Report (Appendix A).

This conservation strategy is aimed at restoring and maintaining the ecological health of watersheds (Karr et al. 1986, Karr 1991, Naiman et al. 1992). The strategy was designed to provide a scientific basis for protecting aquatic ecosystems and enables planning for sustainable resource management. It is a region-wide strategy seeking to retain, restore, and protect those processes and landforms that contribute habitat elements to streams and promote high quality habitat conditions for fish and other aquatic and riparian-dependent organisms. The foundation of the conservation strategy is a refinement of the approach outlined in Thomas et al. (1993).

An effective conservation strategy must protect aquatic ecosystem functions and processes, organized at a watershed scale, while recognizing that land ownership patterns rarely coincide with the distinct topographic boundaries of watersheds. Any conservation strategy that attempts to protect all components of the aquatic ecosystem ranging from unstable and potentially unstable areas in the uplands to mainstem riparian forests must be extensive and comprehensive. Decision criteria for protection, monitoring and restoration must be included.

At the heart of this approach is the recognition that fish and other aquatic organisms evolved within a dynamic environment that has been constantly influenced and changed by geomorphic and ecologic disturbances. Stewardship of aquatic resources has the highest likelihood of protecting biological diversity and productivity when land use activities do not substantially alter the natural disturbance regime to which these organisms are adapted (Swanson et al. 1993).

This conservation strategy employs several tactics to approach the goal of maintaining the “natural” disturbance regime. Land use activities need to be limited or excluded in those parts of the watershed prone to instability. The distribution of land use activities, such as timber harvest or roads, must minimize increases in peak streamflows. Headwater riparian areas need to be protected, so that when debris slides and flows occur they contain coarse woody debris and boulders necessary for creating habitat farther downstream. Riparian areas along larger channels need protection to limit bank erosion, ensure an adequate and continuous supply of coarse woody debris to channels, and provide shade and microclimate protection. Watersheds currently containing the best habitat or those with the greatest potential for recovery should receive increased protection and receive highest priority for restoration programs.

Current scientific understanding of fish habitat relationships is inadequate to allow definition of specific habitat requirements for fish throughout their life cycle at the watershed level. Some general habitat needs of fish are well known, such as deep resting pools, cover, certain temperature ranges, food supply, and clean gravel for spawning (Bjornn and Reiser 1991). However, we cannot specify how these habitats and conditions should be distributed through time and space to provide for the needs of fish. In natural watersheds, different species and age classes interact with multiple habitat elements in

complex ways. This interaction occurs within a landscape where the quality and distribution of habitat elements change with time in relation to natural and management related disturbances to streams and riparian areas.

The Assessment Team believed that any species-specific strategy aimed at defining explicit standards for habitat elements would be insufficient for protecting even the targeted species. To succeed, any Aquatic Conservation Strategy must strive to maintain and restore ecosystem health at watershed and landscape scales. Thus, this is the approach the conservation strategy proposed here employs. This approach seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds. The Assessment Team emphasized, however, that it will require time for this strategy to work. Because it is based on natural disturbance processes, it may take decades, possibly more than a century, to accomplish all of its objectives. Some improvements in aquatic ecosystems, however, can be expected in 10 to 20 years. The Assessment Team believed that if this approach is conscientiously implemented, it will protect habitat for fish and other riparian-dependent species resources and restore currently degraded habitats.

Actual effects, determination of ranges of natural variability, and suggested watershed specific management options will be examined through watershed analysis.

Aquatic Conservation Strategy Objectives

Federal lands within the range of the northern spotted owl will be managed to:

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

Components of the Aquatic Conservation Strategy

1. **Riparian Reserves:** Lands along streams and unstable and potentially unstable areas where special standards and guidelines direct land use.

2. **Key Watersheds:** A system of large refugia comprising watersheds that are crucial to at-risk fish species and stocks and provide high quality water.

3. **Watershed Analysis:** Procedures for conducting analysis that evaluates geomorphic and ecologic processes operating in specific watersheds. This analysis should enable watershed planning that achieves Aquatic Conservation Strategy objectives. Watershed Analysis provides the basis for monitoring and restoration programs and the foundation from which Riparian Reserves can be delineated.

4. **Watershed Restoration:** A comprehensive, long-term program of watershed restoration to restore watershed health and aquatic ecosystems including the habitats supporting fish and other aquatic and riparian-dependent organisms.

These components are designed to operate together to maintain and restore the productivity and resilience of riparian and aquatic ecosystems. Table B6-1 provides further clarification of the role of each component in the Aquatic Conservation Strategy.

Late-Successional Reserves are also an important component of the Aquatic Conservation Strategy. The standards and guidelines under which Late-Successional Reserves are managed provide increased protection for all stream types. Since these reserves possess late-successional characteristics, they offer core areas of high quality stream habitat that will act as refugia and centers from which degraded areas can be recolonized as they recover. Streams in these reserves may be particularly important for endemic or locally distributed fish species and stocks.

1) Riparian Reserves

Riparian Reserves are portions of watersheds where riparian-dependent resources receive primary emphasis and where special standards and guidelines apply. Standards and guidelines prohibit and regulate activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives. Riparian Reserves include those portions of a watershed directly coupled to streams and rivers, that is, the portions of a watershed required for maintaining hydrologic, geomorphic, and ecologic processes that directly affect standing and flowing water bodies such lakes and ponds, wetlands, streams, stream processes, and fish habitats. Riparian Reserves include areas designated in current plans and draft plan preferred alternatives as riparian management areas or streamside management zones and primary source areas for wood and sediment such as unstable and potentially unstable areas in headwater areas and along streams. Riparian Reserves occur at the

[INSERT PLACEHOLDER TABLE B6-1 FULL PAGE]

margins of standing and flowing water, intermittent stream channels and ephemeral ponds, and wetlands. Riparian Reserves generally parallel the stream network but also include other areas necessary for maintaining hydrologic, geomorphic, and ecologic processes.

Under the Aquatic Conservation Strategy, Riparian Reserves are used to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed. The Riparian Reserves will also serve as connectivity corridors among the Late-Successional Reserves.

The Assessment Team developed three Riparian Reserve scenarios that prescribe the Riparian Reserve widths until the agencies complete watershed analyses (Table B6-2). The three scenarios prescribe the same widths for: (1) fish-bearing streams; (2) constructed ponds and reservoirs and wetlands greater than 1 acre; and (3) lakes and natural ponds. The three scenarios reflect differences in the prescribed widths for: (1) permanently flowing nonfish-bearing streams and (2) seasonally flowing or intermittent streams and wetlands less than 1 acre.

Widths for Riparian Reserves necessary to meet Aquatic Conservation Strategy objectives for different water bodies are established based on ecologic and geomorphic factors. The prescribed widths are designed to provide a high level of fish habitat and riparian protection until watershed and site analysis can be completed. Watershed analysis will identify critical hillslope, riparian, and channel processes that must be evaluated in order to delineate Riparian Reserves that assure protection of riparian and aquatic functions. Riparian Reserves are delineated during implementation of site-specific projects based on analysis of the critical hillslope, riparian, and channel processes and features. Although Riparian Reserve boundaries may be adjusted on permanently flowing streams, the Assessment Team considered the prescribed widths to approximate those necessary for attaining Aquatic Conservation Strategy objectives. Post watershed analysis Riparian Reserve boundaries for intermittent streams are expected to be different from the existing boundaries. The reason for the expected difference is the high variability of hydrologic, geomorphic and ecologic processes in a watershed affecting intermittent streams. Thus, the post watershed analysis Riparian Reserve boundaries for permanently flowing streams should approximate the boundaries prescribed in this SEIS whereas post watershed analysis Riparian Reserve boundaries for intermittent streams can be quite different than the boundaries prescribed in this SEIS. The prescribed widths of Riparian Reserves apply to all watersheds until watershed analysis is completed, a site-specific analysis is conducted and described, and the rationale for final Riparian Reserve boundaries is presented.

Thomas et al. (1993) defined a site-potential tree as a tree that has attained the maximum height possible given the site conditions where it occurs. The Assessment Team redefined a site-potential tree as one with the average maximum height of the tallest dominant trees (200 years or more) for a given site class.

Riparian Reserves cover the following five categories of streams or water bodies:

- *Fish-bearing streams* - Riparian Reserves consist of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest.

- *Permanently flowing nonfish-bearing streams* - Riparian Reserves consist of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or depending on the Riparian Reserve scenario - extension from the edges of a stream channel to a distance equal to the height of some fraction of a site-potential tree, or a specified slope distance, whichever is greatest.

[INSERT PLACEHOLDER TABLE B6-2 FULL PAGE]

- *Constructed ponds and reservoirs, and wetlands greater than 1 acre* - Riparian Reserves consist of the body of water or wetland and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the wetland greater than 1 acre or the maximum pool elevation of constructed ponds and reservoirs, whichever is greatest. This is the same in all Riparian Reserve scenarios.

- *Lakes and natural ponds* - Riparian Reserves consist of the body of water or wetland and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable and potentially unstable areas, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance, whichever is greatest. This is the same in all Riparian Reserve scenarios.

- *Seasonally flowing or intermittent streams, wetlands less than 1 acre, and unstable and potentially unstable areas* - This category applies to features with high variability in size and site-specific characteristics. At a minimum, the Riparian Reserve must include:

  The extent of unstable and potentially unstable areas.

  The stream channel and extend to the top of the inner gorge.

  The stream channel or wetland and the area from the edges of the stream channel or wetland to the outer edges of the riparian vegetation.

  Depending on the Riparian Reserve scenario, extension from the edges of the stream channel to a distance equal to the height of some fraction of a site-potential tree, or a specified slope distance, whichever is greatest.

Including intermittent streams and wetlands within Riparian Reserves is important for successful implementation of the Aquatic Conservation Strategy. Accurate identification of these features is critical to correctly implement the strategy and protect the intermittent stream and wetland functions and processes. Identification of these features is difficult at times due to the lack of surface water or wet soils during dry periods. The following discussion provides guidance on steps to identify these features for inclusion within Riparian Reserves.

Intermittent streams - Fish-bearing streams are distinguished from intermittent streams by the presence of any species of fish for any duration. Many intermittent streams may be used as spawning and rearing streams, refuge areas during flood events in larger rivers and streams or travel routes for fish emigrating from lakes. In these instances the standards and guidelines for fish-bearing streams would apply to those sections of the intermittent stream used by the fish. Intermittent streams are defined as any nonpermanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria.

The following discussion pertains to Riparian Reserve widths on intermittent streams and wetlands necessary to meet Aquatic Conservation Strategy objectives. Other objectives, such as Riparian Reserves providing wildlife dispersal corridors, could lead to Riparian Reserve widths different than those necessary to protect the ecological integrity of the intermittent stream or wetland. These other objectives could yield wider Riparian Reserves than those necessary to meet Aquatic Conservation Strategy objectives. There can never be instances where Riparian Reserves would be narrower than the widths necessary to meet Aquatic Conservation objectives.

The width of Riparian Reserves necessary to protect the ecological integrity of intermittent streams varies with slope and rock type. Figure B6-1 shows the estimated size of Riparian Reserves necessary to protect the ecological values of intermittent streams with different slope and rock types. These estimates were made by geomorphologists, hydrologists, and fish biologists from the Bureau of Land Management, Forest Service, and the Environmental Protection Agency. These distances are consistent with the height of one site-potential tree, as discussed above.

Watershed analysis provides the ecological and geomorphic basis for changing the size and location of Riparian Reserves.

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Wetlands - The combination of hydrology, soils, and vegetative characteristics are the primary factors influencing the development of wetland habitats. There must be the presence of surface water or saturated soils to significantly reduce the oxygen content in the soils to zero or near zero concentrations. These low or zero soil oxygen conditions must persist for sufficient duration to promote development of plant communities that have a dominance of species adapted to survive and grow under zero oxygen conditions. These wetland characteristics apply when defining wetlands for regulatory jurisdiction (Dept. of the Army 1987) or for technical analysis when conducting inventories or functional assessments. Seeps and springs can be classified as streams if they have sufficient flow in a channel or as seasonal or perennial wetlands under the criteria defined in the 1987 Corps of Engineers Wetlands Manual (Dept. of the Army 1987). The standards and guidelines for wetlands, which are based on the hydrologic, physical and biologic characteristics described in the manual, apply to seeps and springs regardless of their size.

Formal definition for implementing section 404 of the Clean Water Act, adopted by the Environmental Protection Agency, is as follows:

> The term wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

Detailed technical methods have been developed to assist in identification of wetlands in the field that meet the above definition. Currently, the field manual being used for implementing the Clean Water Act is the "1987 Corps Manual" (Dept. of the Army 1987).

For purposes of conducting the National Wetland Inventory, the Fish and Wildlife Service has broadly defined both vegetated and nonvegetated wetlands as follows:

> Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes, (2) the substrate is predominantly undrained hydric soil, and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al 1979).

Wetlands typically occur within and adjacent to riparian zones. It is frequently difficult to differentiate wetlands from riparian areas based on the definitions. Most typically, and particularly in forested landscapes, the riparian zone is defined by its spatial relation to adjacent streams or rivers. However, riparian zones are also commonly considered to be lands integrally related to other aquatic habitats such as lakes, reservoirs, intermittent streams, springs, seeps, and wetlands.

Because of such conceptual and definitional vagaries, there is spatial overlap between wetlands and riparian zones. This then results in only a portion of the riparian zone associated with rivers and streams being considered wetlands. The extent of that portion will depend on the specifics of hydrologic, vegetation, and soil features. The functions of the wetland portion may also be distinct from the nonwetlands. For example, wetlands may provide habitat for specialized plant species or reproductive habitat for amphibians or other organisms that would not be provided by riparian areas.

Once the Riparian Reserve width is established, either based on existing widths or watershed analysis, then land management activities allowed in the Riparian Reserve will be directed by standards and guidelines for managing Riparian Reserves. The standards and guidelines for Riparian Reserves, described later in this appendix, prohibit or regulate activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives.

2) Key Watersheds

Refugia are a cornerstone of most species conservation strategies. They are designated areas that either provide, or are expected to provide, high quality habitat. A system of Key Watersheds that serve as refugia is crucial for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species. These refugia include areas of high quality habitat as well as areas of degraded habitat. Key Watersheds with high quality conditions will serve as anchors for the potential recovery of depressed stocks. Those of lower quality habitat have a high potential for restoration and will become future sources of high quality habitat with the implementation of a comprehensive restoration program (see Watershed Restoration later in this portion of Appendix B).

The Aquatic Conservation Strategy includes two designations for Key Watersheds. Tier 1 (Aquatic Conservation Emphasis) Key Watersheds contribute directly to conservation of at-risk anadromous salmonids, bull trout, and resident fish species. They also have a high potential of being restored as part of a watershed restoration program. Tier 1 Key Watersheds consist primarily of watersheds identified previously by Johnson et al. (1991) and Thomas et al. (1993). The network of 143 Tier 1 Key Watersheds ensures that refugia are widely distributed across the landscape. While 21 Tier 2 (other) Key Watersheds may not contain at-risk fish stocks, they are important sources of high quality water. The Key Watersheds are displayed on the map accompanying this SEIS and delineated in Table B6-3. Many of these had been identified by Johnson et al. (1991) and Thomas et al. (1993) and their designations changed during the preparation of the FEMAT Report. See Chapter V of the FEMAT Report for more discussion.

The original identification of key watersheds in Johnson et al. (1991) was done by fish biologists and hydrologists from each of the National Forests within the range of the northern spotted owl. The criteria for Tier 1 watersheds listed above were used to identify the individual watersheds at that time. Each National Forest was asked to develop a map showing the distribution of anadromous fish or other fish species and to identify the best existing habitats. Additionally, each National Forest identified watersheds that had the greatest potential for restoration to become high quality habitat for anadromous and other fish species in the future. After each National Forest had identified key watersheds, a comprehensive map was developed. Distribution of the watersheds relative to each other, distribution within major drainage basins, and the distribution relative to private and state lands was examined. Adjustments were made where deemed necessary.

The Assessment Team did not have a set of quantitative criteria (e.g., dispersal distance, number of pairs, etc.) like those developed for the northern spotted owl. The result was that the Assessment Team relied on professional judgement to determine if the system appeared to be adequate in terms of the amount and distribution of habitat for the major stocks across the region. Reeves and Sedell (1992) give a more detailed discussion of the development of the Key Watershed network.

The Key Watershed network includes streams used by 176 of the 257 at-risk fish stocks that inhabit federal lands (Tables B6-4 and B6-5). At-risk fish stocks are stocks that are at a high to moderate risk of extinction (Table B6-4) (Higgins et al. 1992, Nehlsen et al. 1991, Nickelson et al. 1992, and Wash. Dept. of Fisheries et al. 1993) . Of the 82 at-risk stocks not covered by Key Watersheds, 68 occur on Forest Service administered watersheds, 9

on BLM administered watersheds and 5 on National Park Service administered watersheds. Also, 11 of the 82 are chum salmon that use streams and stream segments downstream of federal lands. Not all of the at-risk anadromous salmonid stocks are likely to qualify as species as defined by the Endangered Species Act. While the Act defines "species" to include "any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature," the National Marine Fisheries Service has further refined and interpreted the term "distinct population segment" as it applies to Pacific salmon. The National Marine Fisheries Service considers a stock to be "distinct" if it represents an evolutionarily significant unit of the biological species (Waples 1991). A stock, or group of stocks, must meet two criteria to be considered by the National Marine Fisheries Service to constitute an evolutionarily significant unit: (1) it must be substantially reproductively isolated from conspecific (of the same species) units, and (2) it must represent an important component in the evolutionary legacy of the species. The second criterion could be confirmed, for example, if the stock contains unique genetic characteristics, a unique life history trait, or displays an unusual or distinctive adaptation to its environment.

The major changes between the Assessment Team's review and the efforts reported by Johnson et al. (1991) and Thomas et al. (1993) in regards to Key Watersheds were: (1) identification of Key Watersheds, using the criteria listed above, on lands administered by the BLM; and (2) identification of Tier 2 Key Watersheds. The latter were identified because of the increasing concern about water quality raised by the Environmental Protection Agency. Studies had shown that 70 percent of streams on lands administered by the BLM, and over 50 percent of streams on lands administered by the Forest Service, were out of compliance with clean water standards (FEMAT Report, Chapter V).

Long-term management within Key Watersheds requires watershed analysis prior to further resource management activity. In the short term, watershed analyses must be completed before initiating actions within a Key Watershed, except those actions that are categorically excluded from documentation in an environmental analysis or environmental impact statement (40 CFR 1508.4). Timber harvest, including salvage, can not occur in Key Watersheds until the agencies complete a watershed analysis. All categorically excluded projects must respect Riparian Reserve boundaries and comply with standards and guidelines. Key Watersheds that currently contain poor quality habitat are believed to have the best opportunity for successful restoration and will receive priority in any watershed restoration program.

Roadless Areas and Key Watersheds

Management activities in inventoried roadless areas with unstable land will increase the risk to aquatic and riparian habitat, impair the capacity of Key Watersheds to function as intended, and limit the potential to achieve Aquatic Conservation Strategy objectives. Standards and guidelines that refer to inventoried roadless areas (or simply "roadless areas") apply only to those portions of such areas that would still qualify as roadless under the guidelines used to originally designate the areas as roadless.

To protect the remaining high quality habitats, no new roads will be constructed in inventoried roadless areas in Key Watersheds under all alternatives except Alternatives 7 and 8. The Assessment Team recommended that the agencies reduce the existing road mileage within Key Watersheds, if funding permits. Watershed analysis must be conducted in all non-Key Watersheds which contain roadless areas before any management activities can occur within those roadless areas.

The amount of existing system and nonsystem roads within Key Watersheds should be reduced. Reducing road mileage refers to decommissioning the road. Road closures with gates or barriers do not qualify as decommissioning or a reduction in road mileage. If funding is insufficient to implement reductions, there will be no net increase in the amount of roads in Key Watersheds. That is, for each mile of new road constructed, at least one mile of road should be decommissioned (see also FEMAT Report, Chapter V, Appendix J), and priority given to roads that pose the greatest risks to riparian and aquatic ecosystems.

3) Watershed Analysis

Watershed analysis is required in Key Watersheds, non-Key Watersheds containing inventoried roadless areas and Riparian Reserves prior to determining how proposed land management activities meet Aquatic Conservation Strategy objectives. In the short term, watershed analyses must be completed before initiating actions within a Key Watershed, except those actions that are categorically excluded from documentation in an environmental analysis or environmental impact statement (40 CFR 1508.4). Timber harvest, including salvage, can not occur in Key Watersheds until the agencies complete a watershed analysis. Ultimately however, watershed analysis should be conducted in all watersheds on federal lands as a basis for ecosystem planning and management.

Watershed analysis, as described here, focuses on its role in implementing the Aquatic Conservation Strategy. The broader role of watershed analysis in relation to implementing the ecosystem management objectives proposed by this SEIS is described in Chapter 2. Watershed analysis is one of the principal analyses on which decisions implementing the Aquatic Conservation Strategy will be made.

Watershed analysis has a critical role in providing for aquatic and riparian habitat protection. In planning for ecosystem management and establishing Riparian Reserves to protect and restore riparian and aquatic habitat, the overall watershed condition and the array of processes operating there need to be considered. Watershed condition includes more than just the state of the channel and riparian area. It also includes the condition of the uplands, distribution and type of seral classes of vegetation, land use history, effects of previous natural and land-use related disturbances, and distribution and abundance of species and populations throughout the watershed. These factors strongly influence the structure and functioning of aquatic and riparian habitat (Naiman et al. 1992). Effective protection strategies for riparian and aquatic habitat on federal lands must accommodate the wide variability in landscape conditions present across the Pacific Northwest. Watershed analysis plays a key role in the Aquatic Conservation Strategy, ensuring that aquatic system protection is fitted to specific landscapes.

Watershed analysis will focus on collecting and compiling information within the watershed that is essential for making sound management decisions. It will be an analytical process, not a decision-making process with a proposed action requiring NEPA documentation. It will serve as the basis for developing project-specific proposals, and monitoring and restoration needs for a watershed. Some analysis of issues or resources may be included in broader scale analyses because of their scope. The information from the watershed analyses will contribute to decision making at all levels. Project-specific NEPA planning will use information developed from watershed analysis. For example, if watershed analysis shows that restoring certain resources within a watershed could contribute to achieving landscape or ecosystem management objectives, then subsequent decisions will need to address that information.

The results of watershed analyses may include a description of the resource needs, capabilities, opportunities, the range of natural variability, spatially explicit information that will facilitate environmental and cumulative effects analyses for NEPA, and the processes and functions operating within the watershed. Watershed analysis will identify potentially disjunct approaches and conflicting objectives within watersheds. The information from watershed analysis will be used to develop priorities for funding, and implementing actions and projects, and will be used in developing monitoring strategies and objectives. The participation of adjacent landowners, private citizens, interest groups, industry, different government agencies, and others in watershed analysis will be promoted.

Watershed analysis is a systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. This information will support decisions for implementing management prescriptions, including setting and refining boundaries of Riparian and other Reserves, developing restoration strategies and priorities, and revealing the most useful indicators for monitoring environmental changes. Watershed analysis is an important analytical step supporting ecosystem planning for watersheds of

approximately 20 to 200 square miles (Figure B6-2). It is a key component supporting watershed planning and analyzing the blending of social expectations with the biophysical capabilities of specific landscapes. Watershed analysis is the appropriate level for analyzing the effects of transportation systems on aquatic and riparian habitats within the target watershed. In contrast, issues pertaining to stocks-at-risk would generally be more applicable at the province/river basin analytical levels, discussed in Chapter 2 of this SEIS, rather than the 20 to 200 square mile watershed level.

Watershed analysis consists of technically rigorous and defensible procedures designed to identify processes that are active within a watershed, how those processes are distributed in time and space, the current upland and riparian conditions of the watershed, and how all of these factors influence riparian habitat and other beneficial uses. The analysis is conducted by an interdisciplinary team consisting of geomorphologists, hydrologists, soil scientists, biologists and other specialists as needed. Information used in this analysis includes: maps of topography, stream networks, soils, vegetation, geology; sequential aerial photographs; field inventories and surveys, including landslide, channel, aquatic habitat, and riparian condition inventories; census data on species presence and abundance; disturbance and land use history; and other historical data (e.g., streamflow records, old channel surveys).

Watershed analysis is organized as a set of modules that examine biotic and abiotic processes influencing aquatic habitat and species abundance (i.e., landslides, surface erosion, peak and low streamflows, stream temperatures, road network effects, coarse woody debris dynamics, channel processes, fire, limiting factor analysis for key species, and so on). Results from these modules are integrated into a description of current upland, riparian, and channel conditions; maps of location, frequency, and magnitude of key processes; and location and abundance of key species.

Watershed analysis provides the contextual basis at the site level, for decision makers to set appropriate boundaries of Riparian Reserves, plan land use activities compatible with disturbance patterns, design road transportation networks that pose minimal risk, identify what and where restoration activities will be most effective, and establish specific parameters and activities to be monitored. More detailed site-level analysis is conducted to provide the information and designs needed for specific projects (e.g., road siting or timber sale layout) so that riparian and aquatic habitats are protected.

Watershed analysis provides the ecological and geomorphic basis for changing the size and location of Riparian Reserves necessary to meet Aquatic Conservation Strategy objectives. The following Augusta Creek example from the Willamette National Forest illustrates approaches to adjusting Riparian Reserves based on geomorphic and hydrologic conditions alone. This is not intended to represent the only reasoning for adjusting Riparian Reserves within the range of the northern spotted owl. Design of Riparian Reserves is likely to be a hybrid of decisions based on consideration of sites of special ecological value, slope stability, wildlife dispersal corridors, endemic species considerations and natural disturbance processes.

Figure B6-3 illustrates how slope stability and debris flow runout models may be used as part of watershed analysis for adjusting Riparian Reserves. The result is that the basin is stratified into areas that may require wider or narrower Riparian Reserves than those conforming to Riparian Reserve Scenario 1 for intermittent streams. For example, on intermittent streams in unstable areas with high potential to generate slides and debris flows, Riparian Reserves wider than those conforming to the definition may be necessary to ensure ecological integrity. Riparian Reserves in more stable areas may be less extensive, managed under upland standards and guidelines (e.g., levels of green tree retention as either single trees or in patches of a specific size), or a combination of these.

Slope stability analysis for Augusta Creek is an example in which likely impact mechanisms are identified (Figure B6-4). Distribution of areas subject to slope instability was interpreted from information contained within the Willamette National Forest Soil Resource Inventory. Slope data for each mapped unit was extracted from the Willamette National Forest Soil Resource Inventory based on whether hillslope gradients were less than 30 degrees, between 30 and 60 degrees, and greater than 60 degrees. Geologic descriptions from the Willamette National Forest Soil Resource Inventory were used to determine whether underlying bedrock was hard, moder-

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ately hard, or soft. A hazard rating of low, moderate, or high slide potential to each mapped unit was assigned based on hillslope gradient and geologic description (Figure B6-4). Predicted hazard ratings were tested and found to be in excellent agreement with the historical pattern of landslides observed on aerial photographs. This analytical step ensures that field and analysis time will be used efficiently to address the most important processes and issues in the watershed.

Using the results from the slope stability analysis, watersheds were stratified into subareas in order to evaluate the watersheds as uniform response units for each of the processes or issues of concern. The process of determining debris flow susceptibility for Augusta Creek is an example of how a watershed might be stratified and how this stratification may be used as a basis for mapping Riparian Reserves (Figure B6-3). To determine the susceptibility of different stream reaches to debris flows, a stream network map was overlaid on the slide potential map (Figure B6-4). Areas with high slope instability were assumed to be most likely to generate debris flows. First-order channels (headward channels without tributaries) were assigned a debris flow hazard rating equal to the slide potential of the surrounding landscape (Figure B6-4). Debris flow hazard to higher order channels downstream was assumed to be a function of two factors: channel gradient (Figure B6-5) and tributary junction angle (Figure B6-6), based on work by Benda (1985) and others. Debris flow hazard was reduced on class where channel gradient was less than three degrees or tributary junction angle exceeded 70 degrees, to produce a map of debris flow potential (Figure B6-7). The stratification will vary according to process or issue.

Within a given physiographic province, similar geographic and topographic features control drainage network and hillslope stability patterns. These features may exert a strong influence on the design of Riparian Reserves. For example, in the highly dissected southern Oregon Coast Range, debris flows originating in channel heads are the primary mass movement process. Large, slow-moving earthflows are dominant in the western Oregon Cascades. Earthflows qualify as unstable and potentially unstable areas and would be analyzed for inclusion within Riparian Reserves for intermittent streams. To adequately protect the aquatic system from management induced landsliding, Riparian Reserve design may vary as a result of these differences. In the Coast Range, Riparian Reserves would tend to be in narrow bands associated with intermittent streams, relatively evenly distributed throughout the basin, while those in the Cascades may be locally extensive and centered around earthflows. Stable areas in other parts of the watershed may have reduced Riparian Reserves on intermittent streams.

Earthflows can cover extensive amounts of land within a watershed. As such, they largely influence the resulting landscape and directly affect aquatic and riparian habitat quality, structure and function. For example, streams flowing through active earthflows would tend to cut the toes of the inner gorges. Thus, the earthflow would serve as a chronic source of sediment to the channel. The effects of constructing roads or harvesting timber on the rate of sediment delivery to the channel on the earthflow would need to be considered during the design of the Riparian Reserve. Thus, the amount of a particular earthflow incorporated into a Riparian Reserve, as identified through watershed analysis, depends on the risk of management-induced disturbances and meeting Aquatic Conservation Strategy objectives. The risk will be determined based on an analysis of the projected instability of the earthflow relative to the recovery rate of aquatic and riparian ecosystems. There will be cases where entire earthflows will be incorporated into Riparian Reserves and cases where only those portions determined to directly affect the rate of achieving Aquatic Conservation Strategy objectives will be incorporated.

The efficacy of many previous analyses at the watershed level suffered from unclear logic used in weighting or combining individual elements, reliance on simple indices to explain complex phenomena, and assumptions of direct or linear relations between land use intensity and watershed response. These previous watershed analyses typically do not consider how key processes are distributed over watersheds within a given landscape and, in many cases, do not distinguish between physiographic provinces, which can vary widely in the importance of individual processes. Furthermore, most of the previous approaches lacked any method to validate their assumptions or results.

While watershed analysis can provide essential information for designing land use activities over the entire watershed, it can also highlight uncertainties in knowledge or understanding that need to be addressed. Watershed analysis is emerging as a new standard for assessing watershed condition and land use impacts. The process described in this SEIS builds on more recent, comprehensive approaches, including the Water Resources Evaluation of Nonpoint Silvicultural Sources program; the watershed analysis procedure developed by the Washington State Timber, Fish and Wildlife program; and the cumulative effects methods

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being developed by the National Council on Air and Stream Improvement. Analysis modules in Watershed Analysis are patterned after the first two approaches because a modular approach allows flexibility in selecting methods appropriate to a particular watershed and facilitates modification of specific techniques as improved methods become available. Unique aspects of the watershed analysis procedure described in the FEMAT Report include explicit consideration of biological as well as physical processes, and the joint consideration of upland and riparian areas (see also FEMAT Report, Chapter V, Appendix I).

Watershed analysis is one of the important aspects of effectively implementing ecosystem planning and management on a watershed basis. Information gained through watershed analysis will be vital to adaptive management over broad physiographic provinces. When current plans and draft plan preferred alternatives are revised, information gathered through watershed analysis will, in part, be the basis of these revisions.

4) Watershed Restoration

Watershed restoration will be an integral part of a program to aid recovery of fish habitat, riparian habitat, and water quality. The analysis of effects described in this SEIS assumed that all the alternatives included a comprehensive watershed restoration program, except Alternative 7. Restoration will be based on watershed analysis and planning. Watershed analysis is essential to identify areas of greatest benefit to cost relationships for restoration opportunities and greatest likelihood of success. Watershed analysis can also be used as a medium to develop cooperative projects involving various landowners. In many watersheds the most critical restoration needs occur on private lands downstream from federally managed lands. Decisions to apply a given treatment depend on the value and sensitivity of downstream uses, transportation needs, social expectations, risk assessment of probable outcomes for success at correcting problems, costs, and other factors. Watershed analysis, including the use of sediment budgets, provides a framework for considering benefit to cost relations in a watershed context. Thus, the magnitude of restoration needs within the planning area will be based on watershed analysis.

A viable, effective program must employ all restoration components and must be long term. Inventory, analysis, the National Environmental Policy Act process, implementation, and monitoring all require time. Without adequate investment in each of these steps, restoration efforts will be ineffective, as demonstrated by past efforts. Funding and an interagency commitment to a program similar to the 10-year program described in the FEMAT Report, Chapter V, Appendix J, is essential.

The most important components of a watershed restoration program are control and prevention of road-related runoff and sediment production, restoration of the condition of riparian vegetation, and restoration of in-stream habitat complexity. Other restoration opportunities exist, such as meadow and wetland restoration and mine reclamation, and these may be quite important in some areas. Regionally however, these opportunities are much less extensive than the three components listed above (see also FEMAT Report, Chapter V, Appendix J).

Roads -Road treatments range from full decommissioning (closing and stabilizing a road to eliminate potential for storm damage and the need for maintenance) to simple road upgrading, which leaves the road open. Upgrading can involve practices such as removing soil from locations where there is a high potential of triggering landslides, modifying road drainage systems to reduce the extent to which the road functions as an extension of the stream network, and reconstructing stream crossings to reduce the risk and consequences of road failure or washing out at the crossings.

The decision to apply a given treatment depends on the value and sensitivity of downstream uses, transportation needs, social expectations, assessment of probable outcomes for success at correcting problems, costs, and other factors. Watershed analysis, including the use of sediment budgets, provides a framework for considering benefit to cost relations in a watershed context. Thus, the magnitude of regional restoration needs will be based on watershed analysis.

Riparian Vegetation - Active silvicultural programs will be necessary to restore large conifers in Riparian Reserves. Appropriate practices may include planting unstable areas such as landslides along streams and flood terraces, thinning densely-stocked young stands to encourage development of large conifers, releasing young conifers from overtopping hardwoods, and reforesting shrub and hardwood-dominated stands with conifers. These practices can be implemented along with silvicultural treatments in uplands areas, although the practices will differ in objective and, consequently, design.

In-stream Habitat Structures - In-stream restoration, based on the interpretation of physical and biological processes and deficiencies during watershed analysis, can be an important component of an overall program for restoring fish and riparian habitat. In-stream restoration measures are inherently short term and must be accompanied by riparian and upslope restoration to achieve long-term watershed restoration. Maintaining desired levels of channel habitat complexity, for example, may best be achieved in the short term by introducing structures. However, a riparian area with the complete array of functions and processes should provide coarse woody debris to the channel in the long term.

Instream restoration will be accompanied by riparian and upslope restoration if watershed restoration is to be successful. In-stream restoration, including in-channel structures, will not be used to mitigate for management actions that degrade existing habitat, as a substitute for habitat protection or to justify risky land-management activities and practices. Priority must be given to protecting existing high quality habitat.

Monitoring

Watershed analysis will support decisions for a variety of planned ecosystem management actions within watersheds. Specific actions may include habitat restoration, sediment reduction programs, road removal and management, timber harvesting, development of a recreation facility, or any of a multitude of activities. Monitoring will be an essential component of these management actions and will be guided by the results of watershed analysis.

General objectives of monitoring will be to (1) determine if best management practices have been implemented (2) determine the effectiveness of management practices at multiple scales, ranging from individual sites to watersheds and (3) validate whether ecosystem functions and processes have been maintained as predicted. In addition, monitoring will provide feedback to fuel the adaptive management process.

Specific monitoring objectives will be derived from results of the watershed analysis and tailored to each watershed. Monitoring at the 20 to 200 square mile watershed level derived from watershed analysis will link monitoring for ecosystem management objectives for multiple scales of province, river basin, smaller watershed and site-specific levels. Specific locations of unstable and potentially unstable areas, roads, and harvest activities will be identified. In addition, the spatial relationship of potentially unstable areas and management actions to sensitive habitats such as wetlands will be determined. This information provides a basis for targeting watershed monitoring activities to assess outcomes associated with risks and uncertainties identified during watershed analyses.

Under natural conditions, river and stream habitats on federal forest lands exhibit an extremely wide diversity of conditions depending on past disturbances, topography, geomorphology, climate and other factors. Consequently, riparian area monitoring must be dispersed among the various landscapes rather than concentrated at a few sites and then extrapolated to the entire forest (Gregory and Ashkenas 1990). Logistical and financial constraints require a stratified monitoring program that includes:

- Post-project site review.
- Reference to subdrainages.
- Basin monitoring.
- A water quality network.
- Landscape integration of monitoring data.

A stratified monitoring program examines watersheds at several spatial and temporal scales. Information is provided on hillslope, floodplain, and channel functions, water quality, fish and wildlife habitat and populations, and vegetation diversity and dynamics.

Parameters selected for monitoring depend on the activities planned for a given watershed designed to specifically address forest practices and associated activities such as road construction and maintenance. Two of the more extensive activities related to water quality are timber harvest and road related operations. Other activities such as mining and instream channel alterations to improve habitat can affect water quality in localized areas. Details on the selection of water quality parameters and interactions can be found in MacDonald et al. (1991). In addition to chemical and physical parameters, biological criteria may be appropriate to monitor using techniques such as Rapid Bioassessment Protocols for macroinvertebrates (Plafkin et al. 1989) or the index of biotic integrity for fish diversity (Karr, 1981; Ohio EPA 1988).

Long-term systematic monitoring in selected watersheds will be necessary to provide reference points for effectiveness and validation monitoring. These watersheds should represent a range of forest and stream conditions which have been exposed to natural and induced disturbance. Requirements for reference evaluation areas are discussed in Gregory and Ashkenas (1990). Reference watersheds, subbasins, and individual sites will be selected as part of the overall adaptive management process proposed as part of Alternative 9.

Study plans will be cooperatively developed based on province\ river basin and watershed level analyses. Long-term data sets from reference watersheds will provide an essential basis for adaptive management and a gauge by which to assess trends in stream condition.

Monitoring plans must be tailored for each watershed. Significant differences in type and intensity of monitoring will occur based on watershed characteristics and management actions. For example, carefully targeted restoration activities may only require effectiveness monitoring of single activities, whereas watershed scale restoration would be accompanied by extensive riparian and instream monitoring. The specific design of monitoring programs can best be accomplished by the local interdisciplinary teams working in cooperation with state programs. Pooling the monitoring resources of federal and state agencies is a necessity to provide interagency consistency and to increase available resources.

Monitoring will be conducted and results will be documented, analyzed and reported by the agency responsible for land management in any particular watershed. Reports will be reviewed by local interdisciplinary teams. In addition, water resource regulatory agencies may review results to determine compliance with appropriate standards and province and river basin level strategies. A cross-section of team members that includes participants from states and regulatory agencies should assess monitoring results and recommend changes in Best Management Practices or the mechanisms for Best Management Practice implementation.

Standards and Guidelines for Riparian Reserves

Timber Management

TM-1. Prohibit timber harvest, including fuelwood cutting, in Riparian Reserves, except as described below. Riparian Reserve acres shall not be included in calculations of the timber base.

a. Where catastrophic events such as fire, flooding, volcanic, wind, or insect damage result in degraded riparian conditions, allow salvage and fuelwood cutting if required to attain Aquatic Conservation Strategy objectives.

b. Remove salvage trees only when watershed analysis determines that present and future woody debris needs are met and other Aquatic Conservation Strategy objectives are not adversely affected.

c. Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.

Roads Management

RF-1. Cooperation among federal, state, and county agencies to achieve consistency in road design, operation, and maintenance necessary to attain Aquatic Conservation Strategy objectives.

RF-2. For each existing or planned road, meet Aquatic Conservation Strategy objectives by:

a. minimizing road and landing locations in Riparian Reserves.

b. completing watershed analyses (including appropriate geotechnical analyses) prior to construction of new roads or landings in Riparian Reserves.

c. preparing road design criteria, elements, and standards that govern construction and reconstruction.

d. preparing operation and maintenance criteria that govern road operation, maintenance, and management.

e. minimizing disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow.

f. restricting sidecasting as necessary to prevent the introduction of sediment to streams.

g. avoiding wetlands entirely when constructing new roads.

RF-3. Determine the influence of each road on the Aquatic Conservation Strategy objectives through watershed analysis. Meet Aquatic Conservation Strategy objectives by:

a. reconstructing roads and associated drainage features that pose a substantial risk.

b. prioritizing reconstruction based on current and potential impact to riparian resources and the ecological value of the riparian resources affected.

c. closing and stabilizing, or obliterating and stabilizing roads based on the ongoing and potential effects to Aquatic Conservation Strategy objectives and considering short-term and long-term transportation needs.

RF-4. New culverts, bridges and other stream crossings shall be constructed, and existing culverts, bridges and other stream crossings determined to pose a substantial risk to riparian conditions will be improved, to accommodate at least the 100-year flood, including associated bedload and debris. Priority for upgrading will be based on the potential impact and the ecological value of the riparian resources affected. Crossings will be constructed and maintained to prevent diversion of streamflow out of the channel and down the road in the event of crossing failure.

RF-5. Minimize sediment delivery to streams from roads. Outsloping of the roadway surface is preferred, except in cases where outsloping would increase sediment delivery to streams or where outsloping is unfeasible or unsafe. Route road drainage away from potentially unstable channels, fills, and hillslopes.

RF-6. Provide and maintain fish passage at all road crossings of existing and potential fish-bearing streams.

RF-7. Develop and implement a Road Management Plan or a Transportation Management Plan that will meet the Aquatic Conservation Strategy objectives. As a minimum, this plan shall include provisions for the following activities:

a. inspections and maintenance during storm events.

b. inspections and maintenance after storm events.

c. road operation and maintenance, giving high priority to identifying and correcting road drainage problems that contribute to degrading riparian resources.

d. traffic regulation during wet periods to prevent damage to riparian resources.

e. establish the purpose of each road by developing the Road Management Objective.

Grazing Management

GM-1. Adjust grazing practices to eliminate impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives. If adjusting practices is not effective, eliminate grazing.

GM-2. Locate new livestock handling and/or management facilities outside Riparian Reserves. For existing livestock handling facilities inside the Riparian Reserve, ensure that Aquatic Conservation Strategy objectives are met. Where these objectives cannot be met, require relocation or removal of such facilities.

GM-3. Limit livestock trailing, bedding, watering, loading, and other handling efforts to those areas and times that will ensure Aquatic Conservation Strategy objectives are met.

Recreation Management

RM-1. New recreational facilities within Riparian Reserves, including trails and dispersed sites, should be designed to not prevent meeting Aquatic Conservation Strategy objectives. Construction of these facilities should not prevent future attainment of these objectives. For existing recreation facilities within Riparian Reserves, evaluate and mitigate impact to ensure that these do not prevent, and to the extent practicable contribute to, attainment of Aquatic Conservation Strategy objectives. Where this standard cannot be met, require relocation or closure of recreation facilities.

RM-2. Adjust dispersed and developed recreation practices that retard or prevent attainment of Aquatic Conservation Strategy objectives. Where adjustment measures such as education, use limitations, traffic control devices, increased maintenance, relocation of facilities, and/or specific site closures are not effective, eliminate the practice or occupancy.

RM-3. Wild and Scenic Rivers and Wilderness management plans will address attainment of Aquatic Conservation Strategy objectives.

Minerals Management

MM-1. Require a reclamation plan, approved Plan of Operations, and reclamation bond for all minerals operations that include Riparian Reserves. Such plans and bonds must address the costs of removing facilities, equipment, and materials; recontouring of disturbed areas to near pre-mining topography; isolating and neutralizing or removing toxic or potentially toxic materials; salvage and replacement of topsoil; and seedbed preparation and revegetation to meet Aquatic Conservation Strategy objectives.

MM-2. Locate structures, support facilities, and roads outside Riparian Reserves. Where no alternative to siting facilities in Riparian Reserves exists, locate them in a way compatible with Aquatic Conservation Strategy objectives. Road construction will be kept to the minimum necessary for the approved mineral activity. Such roads will be constructed and maintained to meet roads management standards and to minimize damage to resources in the Riparian Reserve. When a road is no longer required for mineral or land management activities, it will be closed, obliterated, and stabilized.
MM-3. Prohibit solid and sanitary waste facilities in Riparian Reserves. If no alternative to locating mine waste (waste rock, spent ore, tailings) facilities in Riparian Reserves exists, and releases can be prevented, and stability can be ensured, then:

a. analyze the waste material using the best conventional sampling methods and analytic techniques to determine its chemical and physical stability characteristics.

b. locate and design the waste facilities using best conventional techniques to ensure mass stability and prevent the release of acid or toxic materials. If the best conventional technology is not sufficient to prevent such releases and ensure stability over the long term, prohibit such facilities in Riparian Reserves.

c. monitor waste and waste facilities after operations to ensure chemical and physical stability and to meet Aquatic Conservation Strategy objectives.

d. reclaim waste facilities after operations to ensure chemical and physical stability and to meet Aquatic Conservation Strategy objectives.

e. require reclamation bonds adequate to ensure long-term chemical and physical stability of mine waste facilities.

MM-4. For leasable minerals, prohibit surface occupancy within Riparian Reserves for oil, gas, and geothermal exploration and development activities where contracts and leases do not already exist. Adjust the operating plans of existing contracts to eliminate impacts that retard or prevent the attainment of Aquatic Conservation Strategy objectives.

MM-5. Sand and gravel mining and extraction within Riparian Reserves will occur only if Aquatic Conservation Strategy objectives can be met.

MM-6. Develop inspection and monitoring requirements and include such requirements in mineral plans, leases or permits. Evaluate the results of inspection and monitoring to modify mineral plans, leases and permits as needed to eliminate impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives.

Fire/Fuels Management

FM-1. Design fuel treatment and fire suppression strategies, practices, and activities to meet Aquatic Conservation Strategy objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuels management activities could be damaging to long-term ecosystem function.

FM-2. Locate incident bases, camps, helibases, staging areas, helispots and other centers for incident activities outside Riparian Reserves. If the only suitable location for such activities is within the Riparian Reserve, an exemption may be granted following review and recommendation by a resource advisor. The advisor will prescribe the location, use conditions, and rehabilitation requirements. Use an interdisciplinary team to predetermine suitable incident base and helibase locations.

FM-3. Minimize delivery of chemical retardant, foam, or additives to surface waters. An exception may be warranted in situations where overriding immediate safety imperatives exist, or, following review and recommendation by a resource advisor, when an escape would cause more long-term damage.

FM-4. Design prescribed burn projects and prescriptions to contribute to attainment of Aquatic Conservation Strategy objectives.

FM-5. Immediately establish an emergency team to develop a rehabilitation treatment plan needed to attain Aquatic Conservation Strategy objectives whenever Riparian Reserves are significantly damaged by wildfire or a prescribed fire burning outside prescribed parameters.
(Additional Fire Management standards and guidelines are included in Appendix B8, Fire Management Standards and Guidelines.)

Lands

LH-1. Identify in-stream flows needed to maintain riparian resources, channel conditions, and fish passage.

LH-2. Tier 1 Key Watersheds: For hydroelectric and other surface water development proposals, require instream flows and habitat conditions that maintain or restore riparian resources, favorable channel conditions, and fish passage. Coordinate this process with the appropriate state agencies. During relicensing of hydroelectric projects, provide written and timely license conditions to Federal Energy Regulatory Commission (FERC) that require flows and habitat conditions that maintain/restore riparian resources and channel integrity. Coordinate relicensing projects with the appropriate state agencies.

For all other watersheds: For hydroelectric and other surface water development proposals, give priority emphasis to instream flows and habitat conditions that maintain or restore riparian resources, favorable channel conditions, and fish passage. Coordinate this process with the appropriate state agencies. During relicensing of hydroelectric projects, provide written and timely license conditions to FERC that emphasize instream flows and habitat conditions that maintain/restore riparian resources and channel integrity. Coordinate relicensing projects with the appropriate state agencies

LH-3. Locate new support facilities outside Riparian Reserves. For existing support facilities inside Riparian Reserves that are essential to proper management, provide recommendations to FERC that ensure Aquatic Conservation Strategy objectives are met. Where these objectives cannot be met, provide recommendations to FERC that such support facilities should be relocated. Existing support facilities that must be located in the Riparian Reserves will be located, operated, and maintained with an emphasis to eliminate adverse effects that retard or prevent attainment of Aquatic Conservation Strategy objectives.

LH-4. Issue leases, permits, rights-of-way, and easements to avoid adverse effects that retard or prevent attainment of Aquatic Conservation Strategy objectives. Adjust existing leases, permits, rights-of-way, and easements to eliminate adverse effects that retard or prevent the attainment of Aquatic Conservation Strategy objectives. If adjustments are not effective, eliminate the activity. Priority for modifying existing leases, permits, rights-of-way and easements will be based on the actual or potential impact and the ecological value of the riparian resources affected.

LH-5. Use land acquisition, exchange, and conservation easements to meet Aquatic Conservation Strategy Objectives and facilitate restoration of fish stocks and other species at risk of extinction.

General Riparian Area Management

RA-1. Identify and attempt to secure in-stream flows needed to maintain riparian resources, channel conditions, and aquatic habitat.

RA-2 Fell trees in Riparian Reserves when they pose a safety risk. Keep felled trees on-site when needed to meet woody debris objectives.

RA-3. Herbicides, insecticides, and other toxicants, and other chemicals shall be applied only in a manner that avoids impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives.

RA-4. Locate water drafting sites to minimize adverse effects on stream channel stability, sedimentation, and in-stream flows needed to maintain riparian resources, channel conditions, and fish habitat.

Watershed and Habitat Restoration

WR-1. Design and implement watershed restoration projects in a manner that promotes long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and attains Aquatic Conservation Strategy objectives.

WR-2. Cooperate with federal, state, local, and tribal agencies, and private landowners to develop watershed-based Coordinated Resource Management Plans or other cooperative agreements to meet Aquatic Conservation Strategy objectives.

WR-3. Do not use mitigation or planned restoration as a substitute for preventing habitat degradation.

Fish and Wildlife Management

FW-1. Design and implement fish and wildlife habitat restoration and enhancement activities in a manner that contributes to attainment of Aquatic Conservation Strategy objectives.

FW-2. Design, construct and operate fish and wildlife interpretive and other user-enhancement facilities in a manner that does not retard or prevent attainment of Aquatic Conservation Strategy objectives. For existing fish and wildlife interpretative and other user-enhancement facilities inside Riparian Reserves, ensure that Aquatic Conservation Strategy objectives are met. Where Aquatic Conservation Strategy objectives cannot be met, relocate or close such facilities.

FW-3. Cooperate with federal, tribal, and state wildlife management agencies to identify and eliminate wild ungulate impacts that are inconsistent with attainment of Aquatic Conservation Strategy objectives.

FW-4. Cooperate with federal, tribal, and state fish management agencies to identify and eliminate impacts associated with habitat manipulation, fish stocking, harvest and poaching that threaten the continued existence and distribution of native fish stocks occurring on federal lands.

Research

RS-1. A variety of research activities may be ongoing and proposed in Key Watersheds and Riparian Reserves. These activities must be analyzed to ensure that significant risk to the watershed values does not exist. If significant risk is present and cannot be mitigated, study sites must be relocated. Some activities not otherwise consistent with the objectives may be appropriate, particularly if the activities will test critical assumptions of this plan; will produce results important for establishing or accelerating vegetation and structural characteristics for maintaining or restoring aquatic and riparian ecosystems; or the activities represent continuation of long-term research. These activities should be considered only if there are no equivalent opportunities outside of Key Watersheds and Riparian Reserves.

RS-2. Current, funded, agency-approved research, which meets the above criteria, is assumed to continue if analysis ensures that a significant risk to Aquatic Conservation Strategy objectives does not exist. Research and other BLM

and Forest Service units will, within 90 days of the signing of the Record of Decision of this SEIS, submit a brief project summary to the Regional Ecosystem Office of ongoing research projects that are potentially inconsistent with other standards and guidelines of the selected alternative but expected to continue under the above research exception. The Regional Ecosystem Office may choose to more formally review specific projects, and may require modification, up to and including cancellation, of those projects having an unacceptable risk to Key Watersheds and Riparian Reserves. Risk will be considered within the context of the Aquatic Conservation Strategy objectives.

Appendix B7
Late-Successional Reserve Standards and Guidelines

Late-Successional Reserve Standards and Guidelines for Multiple-Use Activities Other Than Silviculture

The following standards and guidelines have been adapted from the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub. 1992a) by the SEIS Team, and apply to Late-Successional Reserves and Managed Late-Successional Areas in all alternatives.

Introduction

A variety of activities currently occur in Late-Successional Reserves or may be proposed in the future. The highest priority of Late-Successional Reserves is to protect and enhance habitat for late-successional and old-growth forest related species including the northern spotted owl. These reserves are designed to maintain a functional, interacting, late-successional and old-growth forest ecosystem. As a general guideline, non-silvicultural activities located inside Late-Successional Reserves that are neutral or beneficial to the creation and maintenance of late-successional habitat are allowed.

While most existing uses and development are envisioned to remain, it may be necessary to modify or eliminate some current activities in Late-Successional Reserves that pose adverse impacts. This may require the revision of management guidelines, procedures, or regulations governing these multiple-use activities. Adjustments in standards and guidelines must be reviewed by the Regional Ecosystem Office.

Activities on federal lands are guided by various direction. This direction includes, but is not limited to directives, policy, handbooks, manuals, as well as other plans, regulations, laws, and treaties. The standards and guidelines presented in this appendix supersede other direction except treaties, laws, and regulations unless that direction is more restrictive or provides greater benefits to late-successional forest related species, or unless otherwise specifically noted with respect to a particular alternative. Agencies need to evaluate any activities not described for impacts to the objectives of Late-Successional Reserves.

Road Construction and Maintenance

Road construction in Late-Successional Reserves for silvicultural, salvage, and other activities generally is not recommended unless potential benefits exceed the costs of habitat impairment. If new roads are necessary to implement a practice that is otherwise in accordance with these guidelines, they will be kept to a minimum, be routed through unsuitable habitat where possible, and be designed to minimize adverse impacts. Alternative access methods, such as aerial logging, should be considered to provide access for activities in reserves.

Road maintenance may include felling hazard trees along rights-of-way. Leaving material on site should be considered if available coarse woody debris is inadequate. Topping trees should be considered as an alternative to felling.

Fuelwood Gathering

Fuelwood gathering will be permitted only in existing cull decks, where green trees are marked by silviculturists to thin unsuitable habitat, to remove blowdown blocking roads, and in recently harvested timber sale units where down material will impede scheduled post-sale activities or pose an unacceptable risk of future large-scale disturbances. In all cases these activities should comply with the standards and guidelines for salvage and silvicultural activities.

American Indian Uses

When adverse impacts to Late-Successional Reserves are slight, continuation of tribal uses typically should be recognized as an obligation to treaty or agreement rights, even when the use is inconsistent with the standards and guidelines for Late-Successional Reserves. The Regional Ecosystem Office would approve exceptions to the standards and guidelines if it determines that the objectives of the strategy would not be jeopardized or that treaty obligations so require.

Mining

The impacts of ongoing and proposed mining actions will be assessed, and mineral activity permits will include appropriate stipulations (e.g., seasonal or other restrictions) related to all phases of mineral activity. The guiding principle will be to design mitigation measures that minimize detrimental effects to late-successional habitat.

Developments

Development of new facilities that may adversely affect Late-Successional Reserves should not be permitted. New development proposals that address public needs or provide significant public benefits, such as powerlines, pipelines, reservoirs, recreation sites, or other public works projects will be reviewed on a case-by-case basis and may be approved when adverse effects can be minimized and mitigated. These will be planned to have the least possible adverse impacts on Late-Successional Reserves. Developments will be located to avoid degradation of habitat and adverse effects on identified late-successional species. Existing developments in Late-Successional Reserves such as campgrounds, recreation residences, ski areas, utility corridors, and electronic sites are considered existing uses with respect to Late-Successional Reserve objectives, and may remain, consistent with other standards and guidelines of the selected alternative. Routine maintenance of existing facilities is expected to have less effect on current old-growth conditions than development of new facilities. Maintenance activities may include felling hazard trees along utility rights-of-way, trails, and other developed areas.

Land Exchanges

Land exchanges involving Late-Successional Reserves will be considered if they provide benefits equal to or better than current conditions. Consider land exchanges especially to improve area, distribution, and quality (e.g., connectivity, shape, contribution to biodiversity) of Late-Successional Reserves, especially where public and private lands are intermingled (e.g., checkerboard ownership).

Habitat Improvement Projects

Projects designed to improve conditions for fish, wildlife, or watersheds should be considered if they provide habitat benefits or if their effect on late-successional associated species is negligible. Projects required for recovery of threatened or endangered species should be considered even if they result in some reduction of habitat quality for other late-successional species. For example, watershed rehabilitation projects, such as felling trees along streams, will be coordinated with a wildlife biologist and may include seasonal restrictions. Design and implement watershed restoration projects in a manner that is consistent with Late-Successional Reserve objectives.

Range Management

Range-related management that does not adversely affect late-successional habitat will be developed in coordination with wildlife and fisheries biologists. Adjust or eliminate grazing practices that retard or prevent attainment of reserve objectives. Evaluate effects of existing and proposed livestock management and handling facilities in reserves to determine if reserve objectives are met. Where objectives cannot be met, relocate livestock management and/or handling facilities.

Fire Suppression and Prevention

Each Late-Successional Reserve will be included in fire management planning as part of watershed analysis. Fuels management in Late-Successional Reserves will utilize minimum impact suppression methods in

accordance with guidelines for reducing risks of large-scale disturbances. Plans for wildfire suppression will emphasize maintaining late-successional habitat. During actual fire suppression activities, consult resource specialists (e.g., botanists, fisheries and wildlife biologists, hydrologists) familiar with the area and this SEIS to assure that habitat damage is minimized. Until a fire management plan is completed for Late-Successional Reserves, suppress wildfire to avoid loss of habitat in order to maintain future management options.

Special Forest Products

Special forest products include but are not limited to posts, poles, rails, landscape transplants, yew bark, shakes, seed cones, Christmas trees, boughs, mushrooms, fruits, berries, hardwoods, forest greens (e.g., ferns, huckleberry, salal, beargrass, Oregon grape, and mosses), and medicinal forest products. In all cases, evaluate whether activities have adverse effects on Late-Successional Reserve objectives. Sales will ensure resource sustainability and protection of other resource values such as special status plant or animal species. Where these activities are extensive (e.g., collection of Pacific Yew bark or fungi), it will be appropriate to evaluate whether they have significant effects on late-successional habitat. Restrictions may be appropriate in some cases.

Recreational Uses

Dispersed recreational uses, including hunting and fishing, generally are consistent with the objectives of Late-Successional Reserves. Use adjustment measures such as education, use limitations, traffic control devices, or increased maintenance when dispersed and developed recreation practices retard or prevent attainment of Late-Successional Reserve objectives.

Research
A variety of wildlife and other research activities may be ongoing and proposed in late-successional habitat. These activities must be assessed to determine if they are consistent with late-successional reserve objectives. Some activities (including those within experimental forests) not otherwise consistent with the objectives may be appropriate, particularly if the activities will test critical assumptions of the selected alternative, will produce results important for habitat development, or the activities represent continuation of long-term research. These activities should only be considered if there are no equivalent opportunities outside Late-Successional Reserves.

Current, funded, agency-approved research, which meets the above criteria, is assumed to continue if analysis ensures that a significant risk to Aquatic Conservation Strategy objectives does not exist. Research Stations and other BLM and Forest Service units will, within 90 days of the signing of the Record of Decision for this SEIS, submit a brief project summary to the Regional Ecosystem Office of ongoing research projects that are potentially inconsistent with other standards and guidelines of the selected alternative, but are expected to continue under the above research exception. The Regional Ecosystem Office may choose to more formally review specific projects, and may require modification, up to and including cancellation, of those projects having an unacceptable risk to Late-Successional Reserve objectives.

Rights-of-Way, Contracted Rights, Easements, and Special Use Permits
Access to nonfederal lands through Late-Successional Reserves will be considered and existing right-of-way agreements, contracted rights, easements, and special use permits in Late-Successional Reserves will be recognized as valid uses. New access proposals may require mitigation measures to reduce adverse effects on Late-Successional Reserves. In these cases, alternate routes that avoid late-successional habitat should be considered. If roads must be routed through a reserve, they will be designed and located to have the least impact on late-successional habitat. Review all special use permits and when objectives of Late-Successional Reserves are not being met, reduce impacts through either modification of existing permits or education.

Nonnative species
In general nonnative species (plant and animal) should not be introduced into Late-Successional Reserves. If an introduction of nonnative species is proposed, complete an assessment of impacts and avoid any introduction that would retard or prevent achievement of Late-Successional Reserve objectives. Evaluate impacts of

nonnative species (plant and animal) currently existing within reserves. Develop plans and recommendations for eliminating or controlling nonnative species which are inconsistent with Late-Successional Reserve objectives. Include an analysis of the effects of implementing such programs to other species or habitats within Late-Successional Reserves.

Other

Other activities should be evaluated by local interdisciplinary teams and appropriate guidelines should be written and documented. Activities deemed to have potential adverse effects on Late-Successional Reserve objectives require review of the Regional Ecosystem Office. The Regional Ecosystem Office may develop additional criteria for exempting some additional activities from review.

Appendix B8
Fire Management Standards and Guidelines

This section of Appendix B, an addition in the Final SEIS, is a consolidation of standards and guidelines found in Appendix B2, Ecological Principles for Management of Late-Successional Forests, and Appendix B5, Recovery Plan Standards and Guidelines. Additional clarification and review of these standards and guidelines was provided by the Scientific Advisory Group for consistency with the objectives of the FEMAT Report. Standards and guidelines for the matrix, Administratively Withdrawn Areas, Congressionally Reserved Areas, and Riparian Reserves apply to all alternatives. Standards and guidelines for Adaptive Management Areas apply only to Alternative 9, while those for Late-Successional Reserves apply to Alternative 9 and other alternatives where Guidelines to Reduce Risk of Large-Scale Disturbance apply (Appendix B5, Recovery Plan Standards and Guidelines). In the absence of specific conflicts, fire management direction in existing plans also applies.

Fire Management Standards and Guidelines

One objective of ecosystem analysis and management is to identify disturbance regimes and to manage the landscape within that context. The role of fire management in the maintenance of ecosystems within the range of the northern spotted owl is well recognized. Thus, fire is inherently neither "bad" nor "good," and should be used or suppressed in the context of achieving ecosystem management objectives at the landscape level.

Fire management activities consist of wildfire suppression, wildfire hazard reduction, and prescribed fire applications. In the course of implementing the following standards and guidelines to achieve ecosystem management objectives, it is critical that wildfire suppression and prescribed burning activities do not compromise the safety of firefighting personnel.

A wildfire is defined as any wildland fire that does not meet management objectives, and, thus, requires a suppression response. By regulation, a fire cannot be termed a prescribed fire once it has been declared a wildfire. A prescribed fire is defined as a fire burning within an approved, predefined and planned prescription. It may result from a planned or natural ignition. When a prescribed fire exceeds the prescription and/or planned perimeter, it may be declared a wildfire.

Fire management plans (including the use of prescribed fire for ecosystem management, fuel hazard reduction, and wildfire suppression) will be written or revised for all areas, as necessary, consistent with existing guidance. Additional guidance for fire management planning in Late-Successional Reserves is described below. The plans will be developed in an interdisciplinary manner and include specific objectives to support the unique management of the area. It is important to monitor and evaluate all fire management activities to ensure consistency with ecosystem management objectives.

The use of prescribed fire for ecosystem management will restore processes that have been limited by relatively effective fire exclusion. Most plant communities in the planning area are adapted to fire, although at the natural recurrence of fire is at widely varying intervals. Some species require periodic fire for their persistence (see the discussion of Vascular Plants in Chapter 3&4), and many additional species are well adapted to periodic burning. Fire can also be used effectively in the restoration and maintenance of wildlife habitat.

The goal of wildfire hazard reduction in all land allocations is to reduce the risk of large-scale, high intensity wildfires which would prevent land managers from meeting resource management objectives. It is essential to seek a balance between reducing cost and reducing the risk of wildfire, while promoting management objectives. The judicious use of prescribed fire for hazard reduction has the potential to restore ecosystem processes, lower smoke emissions from wildfires, limit the size of wildfires by facilitating fire suppression (while using methods that have a lower environmental impact), and reduce the costs of wildfire suppression.

Late-Successional Reserves

In Late-Successional Reserves, a specific fire management plan will be prepared prior to any habitat manipulation activities. This plan, as an element of watershed/landscape analysis, province-level planning, or a Late-Successional Reserve plan, should specify how hazard reduction and other prescribed fire applications will meet the objectives of the Late- Successional Reserve. Until the plan is approved, proposed activities will be subject to review by the Regional Ecosystem Office. The Regional Ecosystem Office may develop additional guidelines that would exempt some activities from review. In all Late-Successional Reserves, watershed/landscape-level analysis will provide guidance on how much coarse woody debris to retain when applying prescribed fire.

Riparian and Late-Successional Reserves

In Riparian and Late-Successional Reserves, the goal of wildfire suppression is to limit the size of all fires. When watershed/landscape analysis, province-level planning, or a Late-Successional Reserve plan are completed and approved, some natural fires may be allowed to burn under prescribed conditions. Rapidly extinguishing smoldering coarse woody debris and duff should be considered to preserve these ecosystem elements. In Riparian Reserves, water drafting sites should be located and managed to minimize adverse effects on riparian habitat and water quality, as consistent with the Aquatic Conservation Strategy, Appendix B6.

Adaptive Management Areas

In Adaptive Management Areas, fire managers are encouraged to actively explore and support opportunities to research the role and effects of fire management on ecosystem functions. Cooperation across agency and ownership boundaries should be emphasized. The standards and guidelines in current plans and draft plan preferred alternatives for hazard reduction should be followed until approved Adaptive Management Area plans are established. Fire management experts will participate on the local Interdisciplinary Technical Advisory Panel on all Adaptive Management Areas. Management of Adaptive Management Areas is intended to be innovative and experimental. Wildfire suppression actions, however, should use accepted strategies and tactics, and conform with specific agency policy.

Congressionally Reserved Areas

Fire management in Congressionally Reserved Areas should follow the standards and guidelines in existing Forest and District Plans. Congressionally Reserved Areas may be more fully incorporated into ecosystem management in future land management planning efforts. Revisions to current fire management standards and guidelines may occur when watershed/landscape-level analysis and province-level planning are completed.

Administratively Withdrawn Areas

Administratively Withdrawn Areas have been designated for a wide range of objectives. Fire management activities should be guided by current plans and draft plan preferred alternatives when their objectives are not addressed by this SEIS. Administratively Withdrawn Areas will have no additional standards and guidelines beyond those described in the section Wildfire Suppression Standards and Guidelines Common to All Land Allocations below.

Matrix

For areas in the matrix which are located in the rural interface, fire management activities should be coordinated with local governments, agencies, and landowners during watershed/landscape-level analyses to identify additional factors which may affect hazard reduction goals. Hazard reduction may become more important in the rural interface and areas adjacent to structures, dwellings or other amenities. Fire suppression actions in the matrix will have no additional standards and guidelines.

Prescribed Fire for Ecosystem Maintenance and Restoration

Appropriate resource management experts should be involved in the development of project-level, prescribed fire plans. These plans should identify both the desirable and undesirable effects of burning. Planning and implementation of prescribed burns should be designed to meet stated objectives of the project and the land allocation.

Prescribed burning must adhere to smoke management and air quality standards and guidelines described in this Final SEIS, Chapter 3&4, the Air Quality Analysis section.

The goal of prescribed burning, other than hazard reduction and site preparation, is to maintain or restore ecosystem processes or structures. Natural fire and American Indian use of fire played an important role in the development of these ecosystems. Consequently, land managers should strongly consider the use of prescribed fire when developing alternatives to restore or maintain ecosystem processes or structures in these areas.

Application of prescribed fire for ecosystem maintenance and restoration, and for hazard reduction should vary in extent and frequency of application, and intensity of burning. The differences in applications should be related to the role of natural fire in specific landscapes, current ecosystem needs, and wildfire hazard analysis included in the fire management plan. In general, dry provinces will require more frequent application of prescribed fire over a greater area than other provinces in order to establish and maintain appropriate fuel profiles, and to maintain or restore ecosystem processes. Moist provinces, while requiring less frequent application of fire, can benefit from carefully planned and implemented prescribed burning programs. Deviations from the standards and guidelines of the selected alternative may be necessary due to local fuel-loading conditions. Also, the wide natural variability in provinces and individual stand histories may lead to fuels management prescriptions that are inconsistent with the standards and guidelines of the selected alternative, yet necessary to achieve the overall goal of reducing the threat of large-scale fire.

Fuels Management for Hazard Reduction

The goal of wildfire hazard reduction is to modify fuel profiles in order to lower the potential of fire ignition and the rate of spread. Hazard reduction will also protect and support land allocation objectives by lowering the risk of high intensity, stand-replacing wildfires. This will be accomplished by reducing fuel accumulations to levels that provide the lowest cost plus net value change over time, while remaining consistent with the objectives of the affected land allocation.

Appropriate resource management experts should be included in developing project level hazard reduction plans. These plans should identify levels of coarse woody debris and snags (of adequate size and in sufficient quantities) to meet the habitat requirements of species of concern. Additionally, these plans must provide for the safety of firefighting personnel, and yield a fuel profile that supports land allocation objectives. It is essential to seek a balance between reducing the risk of wildfire, and the cost efficiency consistent with meeting land allocation objectives.

Hazard reduction activities will include, but not be limited to: prescribed burning, mechanical or manual manipulation of forest vegetation and debris; removal of forest vegetation and debris; as well as combinations of these methods. While fuelbreak construction and underburning are both valid hazard reduction techniques, prescribed underburning is generally more effective in reducing wildfire hazard.

Prescribed burning for hazard reduction must adhere to smoke management and air quality standards described in this Final SEIS, Chapter 3&4, in the Air Quality Analysis section.

Wildfire Suppression Standards and Guidelines Common to All Land Allocations

The goal of fire suppression is to minimize the negative impacts of wildfires on ecosystem management objectives, consistent with "costs plus loss" criteria. In the absence of specific conflicts, fire management direction in existing Forest and District Plans also applies.

Fire managers will respond to all wildfires by taking appropriate suppression responses. In most cases, responses will consist of aggressive initial attack to extinguish fires at the smallest size possible. An analysis

(such as a Wildfire Situation Analysis) to determine the appropriate suppression response will be prepared for all wildfires that escape initial attack. This analysis should yield a suppression strategy that achieves fire suppression goals. Analysis teams should involve pertinent resource management experts.

Naturally-ignited fires may be managed as prescribed fires, following site-specific agency direction on a case-by-case basis. However, it is important to recognize that by regulation, wildfires cannot be used to meet resource objectives.

The land allocations of the alternatives in this SEIS have specific attributes that are important to promote and retain. Suppression actions should use strategies and tactics that strive to protect these attributes. Watershed/landscape analyses or Late-Successional Reserve plans will provide direction for managing fire to enhance and protect specific habitat areas and critical land allocation components. Depending on the result of each analysis, specific suppression techniques will be recommended to mitigate damage to the key components of that habitat. The appropriate use of suppression tools such as aircraft, dozers, pumps and other mechanized equipment should be identified and any restrictions relating to their use should be clearly defined. In addition to suppression actions, support efforts (e.g., transportation, fueling, sanitation) and facility establishment (e.g., camps, helibases, staging areas) should be evaluated for potential adverse effects on attaining ecosystem management objectives. Any restrictions to these activities or facility locations should be specified. Until watershed/landscape analyses or Late-Successional Reserve plans are completed, suppression activities should be guided by land allocation objectives in coordination with local resource management specialists.

Structural components such as snags, duff, and coarse woody debris should be protected from wildfire and suppression damage to the extent possible. Trees and snags should be felled only if they pose a threat to firefighter safety or contribute to the risk of wildfire spread. In general, those suppression actions which cause more damage to critical resources (threatened and endangered plant or animal species, and their habitats) than the fire itself should be carefully evaluated and alternative actions considered. Resource management experts should be involved to evaluate potential suppression damage compared to potential wildfire damage.

When taking fire suppression actions in areas where land allocations are intermingled (such as Riparian Reserves within Late-Successional Reserves), fire managers, in consultation with Resource Advisors, should consider the most critical resource and apply standards and guidelines associated with that resource.

Close interagency coordination is essential in mixed-ownership areas to minimize adverse impacts because wildfire suppression activities on nonfederal lands have the potential to adversely affect federal land allocation objectives. Conversely, wildfire suppression activities on federal lands should not cause adverse impacts on nonfederal lands.

The rehabilitation of areas damaged by wildfire suppression activities should be planned with the advice of applicable resource management experts.

Appendix B9
BLM Spotted Owl Standards and Guidelines

Standards and Guidelines Specific to Northern Spotted Owl Habitat for Lands Administered by the Bureau of Land Management in Oregon

The following standards and guidelines are excerpted or adapted from the BLM Revised Preferred Alternative and are specific to northern spotted owl habitat. These standards and guidelines apply to all the action alternatives except Alternative 7.

Designated Conservation Areas, Reserved Pair Areas, and Residual Habitat Areas from the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub. 1992a) and other standards and guidelines of the BLM's Revised Preferred Alternative that are specific to northern spotted owls do not apply except as described below.

1. For lands administered by the BLM north of the Grants Pass line, and including all of the Coos Bay District, outside of the South Willamette-North Umpqua Area of Concern, implement the Connectivity/Diversity Block design from the Revised Preferred Alternative with District modifications approved by the Scientific Advisory Group.

2. Apply additional matrix standards and guidelines to maintain the connectivity value of the I-5 Corridor (South Willamette/North Umpqua Area of Concern) in the Eugene District. Specifically, apply the Connectivity/Diversity Block standards and guidelines to all lands in the area designated as Deferred and Non-Deferred Old-Growth Emphasis Areas in the BLM's Revised Preferred Alternative (USDI unpub. 1992b, see Appendix B1).

   Connectivity/Diversity Block standards or guidelines call for 150-year area control rotations. Overall, 25 to 30 percent of each block will be maintained in late-successional condition, and periodic timber sales will leave 12 to 18 green trees per acre. Riparian Reserves count toward the 25 to 30 percent if they are in late-successional condition. Riparian Reserves do not count toward the 150-year rotation of the area control.

3. Apply Connectivity/Diversity Block standards and guidelines to the entire area of seven Managed Pair Areas and two Reserved Pair Areas near the Medford/Roseburg District boundary and on a portion of the Coos Bay District surrounding Designated Conservation Area OD-33.

4. The General Forest Management Area will be managed to retain six to eight green trees per acre in cutting units.

Appendix B10
Grants Pass Line

Grants Pass Line Between Northern and Southern General Forest Management Areas

Lands in the BLM's Medford District which are allocated to timber management are divided into two separate categories based on site productivity, plant community, and forest condition. The line between these two categories is shown on the following map (Figure B10-1). Standards and guidelines differ on both sides of this line and are described in Appendix B1.

Lands north of this line fall into the generally more productive Northern General Forest Management Area, while lands south of this line, in the Southern General Forest Management Area, are generally less productive and dry.

This line applies to Alternative 9 only. For Alternative 9 standards and guidelines, all lands on the Coos Bay District are considered to be north of this line, while all lands on the Klamath Falls Resource Area of the Lakeview District are considered to be south of this line.

[INSERT PLACEHOLDER FOR FIGURE B10-1 2 FULL PAGES]

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Appendix B11
Standards and Guidelines Resulting From Additional Species Analysis and Changes to Alternative 9

The following standards and guidelines were developed in response to public and internal comments to increase protection of habitat for species whose habitat assessments were relatively low under Alternative 9. They are incorporated in Alternative 9 as standards and guidelines in this Final SEIS.

Survey and Manage. The "survey and manage" standard and guideline would provide benefits to amphibians, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropods. The standard and guideline contains four components, and priorities differ among them:

1. *Manage Known Sites*.
Management of known species sites should receive the highest priority. Efforts must be undertaken to acquire information on these known sites and to manage this information so that it is available to all project planners. An effective way to accomplish this is to compile the information in a Geographic Information System (GIS) data base. Those efforts should be coordinated by the Regional Ecosystem Office, and should be completed expeditiously. As soon as the information becomes available, it should be used in the design or modification of activities. Activities that are implemented in 1994 should use this information to the greatest degree possible. Activities implemented in 1995 and later must include provisions for these known sites. In most cases, the appropriate action will be protection of relatively small sites, on the order of tens of acres. For some species, including some vascular plants, the appropriate action will include the use of specific management treatments such as prescribed fire. For rare and endemic fungus species, areas of 160 acres should be temporarily withdrawn from ground-disturbing activities around known sites until those sites can be thoroughly surveyed and site-specific measures prescribed. For one fungus species, *Oxyporous nobilissimus*, there are only six known sites and two of these do not currently have a protected status. Management areas of 600 acres are to be established around these two sites for the protection of those populations. The actions to protect *Oxyporous* must be undertaken immediately.

2. *Survey Prior to Ground-Disturbing Activities*.
Measures to survey for species and manage newly discovered sites are to be phased-in over a somewhat longer timeframe than the measures to protect currently known sites. For some species, these efforts have been ongoing through rare and sensitive species programs. Where such efforts have been ongoing, they should continue. However, protocols have not been developed for surveys for all of these species, and the expertise needed to conduct them is not readily available in some cases. Efforts to design protocols and implement surveys should be started immediately. Where surveys are completed, the information gathered from them should be used to establish managed sites for species. Surveys must precede the design of all ground-disturbing activities that will be implemented in 1997 or later, and management standards and guidelines will be developed to manage habitat for the species on sites where they are located. These surveys may be conducted at a scale most appropriate to the species. For most species, this survey would start at the watershed analysis level with identification of likely species' locations based on habitat. Those likely locations would then be thoroughly searched prior to implementation of activities. For other species, the identification of likely sites may be most appropriately done at the scale of individual projects. Surveys should be designed for maximum

efficiency, focusing on the likely range and habitats of the target species. Multispecies surveys should be used wherever they would be most efficient. To the degree possible, surveys should be designed to minimize the number of site visits needed to acquire credible information. Survey protocols and proposed site management should be incorporated into interagency conservation strategies developed as part of ongoing planning efforts coordinated by the Regional Ecosystem Office.

3. *Extensive Surveys*.
Conduct extensive surveys for the species to find high priority sites for species management. Specific surveys prior to ground-disturbing activities are not a requirement. Rather, the surveys will be done according to a schedule that is most efficient, and sites will be identified for protection at that time. This strategy entails some risk because some species sites may be disturbed prior to completion of surveys. It is recommended primarily for species whose characteristics make site and time-specific surveys difficult. For example, some fungi only produce fruiting bodies under specific climatic conditions, therefore, finding their location may take several to many years. It would be most efficient to do broad surveys for these species during times of appropriate conditions rather than attempting annual, site-specific surveys. Surveys under this strategy must be underway by 1996. As with surveys described in item 2 above, surveys should be designed for efficiency and standardized protocols should be developed.

4. *General Regional Surveys*.
The objective is to survey for the species to acquire additional information and to determine necessary levels of protection. Species intended to benefit from this standard and guideline are the arthropods, the fungi species that were not classed as rare and endemic, bryophytes, and lichens. These groups of species are particularly poorly known. Many species have likely not yet been identified, and there is only general information available on the abundance and distribution of known species. The information gathered through these efforts may be useful in refining the selected alternative as part of the adaptive management process to better provide for these species. These surveys are expected to be both extensive and expensive, but the information from them is critical to successful implementation of ecosystem management. They should be completed within 10 years.

Table B11-1 shows species covered by the survey and manage provision, and which of the four strategies above is to be applied to each. These measures may apply within any land allocations. However, the survey and manage provision for each species will be directed to the range of that species and the particular habitats that it is known to occupy.

Riparian Reserves.

Riparian Reserve Scenario 1 will be applied on intermittent streams throughout the range of the northern spotted owl. This is a change from the Draft SEIS that specified Riparian Reserve Scenario 2 outside of Tier 1 Key Watersheds. Scenario 1 is described in Appendix B6, Aquatic Conservation Strategy, and in Chapter 2 of this Final SEIS. As noted in Chapter 2, the prescribed Riparian Reserve widths for intermittent streams may be adjusted in decisions following watershed analysis. That analysis should take into account all species that were intended to be benefited by this standard and guideline. Those species include fish, mollusks, amphibians, lichens, fungi, bryophytes, vascular plants, American marten, red tree voles, bats, marbled murrelets, and northern spotted owls. The specific issue for spotted owls is retention of adequate habitat conditions for dispersal.

The second standard and guideline for riparian species is to ensure that riparian management in Adaptive Management Areas provides species protection equivalent to Riparian Reserves. In most cases, riparian protection in Adaptive Management Areas should be comparable to that prescribed for other federal land allocations. However, in those cases where alternate means are proposed to meet riparian objectives, those alternate means must meet objectives for management of all species. In areas where there are concerns about species as noted

above, species protection takes priority over any objectives that would reduce reserves, and adjustments to Riparian Reserves should take into account all species that were intended to be benefited by this standard and guideline.

Matrix Management Standards and Guidelines.

A variety of provisions for forest management in the matrix will be implemented. These measures build on the standards and guidelines originally presented in the Draft SEIS. The measures include standards and guidelines for coarse woody debris, revised standards and guidelines for green-tree and snag retention, modification of site treatment practices, provisions to protect cave entrances, and measures that provide additional protection of late-successional forests in watersheds where they are currently scarce. These measures are described as follows.

Provide Specified Amounts of Coarse Woody Debris in Matrix Management.

A renewable supply of large down logs is critical for maintaining populations of fungi, arthropods, bryophytes and various other organisms that use this habitat structure. Provision of coarse woody debris is also a key standard and guideline for American marten, fisher, two amphibians, and two species of vascular plants. The objective is to provide coarse woody debris well distributed across the landscape in a manner that meets the needs of species and provides for ecological functions. Standards and guidelines should provide for appropriate coarse woody debris quantity, quality (such as species, decay stage and size) and distribution. Models for computing expected numbers and sizes of logs should be developed for groups of plant associations and stand types which can be used as a baseline for managers to develop prescriptions for landscape management. An important factor is to provide the coarse woody debris within a forest patch so that the appropriate microclimate for various organisms that use this substrate is available. Coarse woody debris that is already on the ground needs to be retained and protected from disturbance to the greatest extent possible during logging and other land management activities that might destroy the integrity of the substrate. As the stand regenerates, scattered green trees will provide a future supply of coarse woody debris and will be important in providing for the distribution of this substrate throughout the managed landscape.

Specific Standards and Guidelines for Coarse Woody Debris. These measures are intended to be applied in matrix forests. The intent of the measures must also be met in Adaptive Management Areas, but specific standards and guidelines are not prescribed for those areas.

A. Manage to provide a renewable supply of large down logs well distributed across the matrix landscape in a manner that meets the needs of species and provides for ecological functions. Develop models for groups of plant associations and stand types that can be used as a baseline for developing prescriptions.

B. The following interim guidelines apply in areas of regeneration harvests: for northern California National Forests, use the Draft Forest Plan standards and guidelines for down logs; for western Oregon and Washington north of and including the Willamette National Forest, leave 240 linear feet of logs per acre greater than or equal to 20 inches in diameter. Logs less than 20 feet in length can not be credited toward this total. In eastern Oregon and Washington, and western Oregon south of the Willamette National Forest and the Eugene BLM District, a minimum of 120 linear feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long should be retained. Decay class 1 and 2 logs can be counted towards these totals. Down logs should reflect the species mix of the original stand. In all cases, standards and guidelines from current plans and draft plan preferred alternatives apply if they provide greater amounts. In areas of partial harvest, the same basic guidelines should be applied, but they should be modified to reflect the timing of stand development cycles where partial harvesting is practiced.

C. Coarse woody debris already on the ground should be retained and protected to the greatest extent possible from disturbance during treatment (e.g., slash burning and yarding) which might otherwise destroy the integrity of the substrate.

D. Down logs should be left within forest patches that are retained under green tree retention standards and guidelines in order to provide the microclimate that is appropriate for various organisms that use this substrate.

E. As with all standards and guidelines, these are meant to provide initial guidance, but further refinement will be required for specific geographic areas. This can be accomplished through planning based on watershed analysis, and the adaptive management process.

Emphasize Clumped Green-Tree and Snag Retention in Matrix Management. For many species, benefits will be greatest if trees are retained in patches rather than singly. Because very small patches do not provide suitable microclimates for many of these organisms, patches should generally be larger than 1 hectare (about 2.5 acres, unit size permitting). Although many species would benefit from retention of patches, others may be favored by retention of single trees. Ultimately, the relative proportion of patches versus single trees retained must reflect local knowledge of individual species' needs.

Retained patches should be protected for multiple rotations to provide support for those organisms that require very old forests.

Specific standards and guidelines for green-tree and snag retention . These measures are intended to be applied throughout the matrix forests. Their intent should be met in Adaptive Management Areas, but standards and guidelines are not prescribed for those areas.

A. For lands administered by the BLM in Oregon, follow standards and guidelines described in Chapter 2 and Appendix B9.

B. For all other lands, retain at least 15 percent of the area of each cutting unit except within the Oregon Coast Range and Olympic Peninsula Provinces. On the Mt. Baker-Snoqualmie National Forest, this retention guideline does not apply, but site-specific prescriptions should be developed to maintain biological diversity and ecosystem function, including retention of green trees (singly and in patches), snags and down logs. Exceptions are made for the Oregon Coast Range and Olympic Peninsula Provinces because substantial retention is provided by marbled murrelet and riparian protection measures. If, as a result of watershed analysis or any future delisting of the murrelet, protection is reduced significantly, green-tree retention standards and guidelines may be required in these provinces.

B. Of the total area to be retained, at least 70 percent should be in patches greater than 1 hectare (unit size permitting), with the remainder as single trees or smaller patches dispersed across the cutting unit. To the extent possible, patches should include the largest, oldest live trees, decadent or leaning trees, and hard snags occurring in the unit. Patches should be retained indefinitely.

C. As a minimum, snags are to be retained within the harvest unit at levels sufficient to support species of cavity-nesting birds at 40 percent of potential population levels based on published guidelines and models. The objective is to meet the 40 percent minimum standard throughout the matrix, with per-acre requirements met on average areas no larger than 40 acres. To the extent possible, snag management within harvest units should occur within the areas of green-tree retention. The needs of bats should also be considered in these standards and guidelines as those needs become better known.

D. As with all standards and guidelines, these are meant to provide initial guidance, but further refinement will be required for specific geographic areas. This can be accomplished through planning based on watershed analysis, and the adaptive management process which includes significant oversight review.

Provide Additional Protection for Caves, Mines, and Abandoned Wooden Bridges and Buildings that are Used as Roost Sites for Bats.

Most bat species occurring in the Pacific Northwest roost and hibernate in crevices in protected sites. Suitable roost sites and hibernacula, however, fall within a narrow range of temperature and moisture conditions. Sites commonly used by bats include caves, mines, snags and decadent trees, wooden bridges, and old buildings. Additional provisions for the retention of large snags and decadent trees are included in the standard and guideline for green-tree patches in the matrix. Caves, mines, and abandoned wooden bridges and buildings, however, are extremely important roost and hibernation sites, and require additional protection to ensure their value as habitat is maintained.

This provision is intended to apply in matrix forests and Adaptive Management Areas. Conduct surveys of crevices in caves, mines, and abandoned wooden bridges and buildings for the presence of roosting bats, including fringed myotis, silver-haired bats, long-eared myotis, long-legged myotis, and pallid bats. For the purposes of this standard and guideline, caves are defined as in the Federal Cave Resources Protection Act of 1988 as "any naturally occurring void, cavity, recess, or system of interconnected passages which occur beneath the surface of the earth or within a cliff or ledge (...but not including any...man-made excavation) and which is large enough to permit an individual to enter, whether or not the entrance is naturally formed or man-made." Searches should be conducted during the day in the summer (to locate day roosts and maternity colonies), at night during the late summer and fall (to locate night roosts, which are important for reproduction), and during the day in the winter (to locate hibernacula). If bats are found, identify the species using the site and determine for what purpose it is being used by bats. As an interim measure, timber harvest is prohibited within 250 feet of sites containing bats. Management standards and guidelines, which may be included as mitigation measures in project or activity plans, will be developed for the site. These standards and guidelines will be developed following an inventory and mapping of resources. The purpose of the standards and guidelines will be protection of the site from destruction, vandalism, disturbance from road construction or blasting, or any other activity that could change cave or mine temperatures or drainage patterns. The size of the buffer, and types of activities allowed within the buffer, may be modified through the standards developed for the specific site. Retention of abandoned bridges or buildings must be made contingent on safety concerns.

Townsend's big-eared bats are of concern to state wildlife agencies in both Washington and Oregon. These bats are strongly associated with caves, and are extremely sensitive to disturbance, especially from recreational cavers. When Townsend's big-eared bats are found occupying caves or mines on federal land, the appropriate agency should be notified, and management prescriptions for that site should include special consideration for potential impacts on this species.

Modify Site Treatment Practices, Particularly the Use of Fire and Pesticides, and Modify Harvest Methods to Minimize Soil and Litter Disturbance.

Many species of soil and litter-dwelling organisms, such as fungi and arthropods, are sensitive to soil and litter disturbance. Site treatments should be prescribed that will minimize intensive burning, unless appropriate for certain specific habitats, communities or stand conditions. Prescribed fires should be planned to minimize the consumption of litter and coarse woody debris. Other aspects to this standard and guideline include minimizing soil and litter disturbance that may occur as a result of yarding and operation of heavy equipment, and reducing the intensity and frequency of site treatments. Soil compaction, and removal or disturbance of humus layers and coarse woody debris, may impact populations of fungi and arthropods. These provisions are intended to apply throughout the matrix forests and within the Adaptive Management Areas.

Provide for Retention of Old-Growth Fragments in Watersheds Where Little Remains.

The distribution of old-growth stands throughout the landscape is an important component of ecosystem diversity, and plays a significant role in providing for biological and structural diversity across the landscape. Isolated remnant old-growth patches are ecologically significant in functioning as refugia for a host of old-growth associated species, particularly those with limited dispersal capabilities that are not able to migrate across large landscapes of younger stands. These include, but are not limited to, many species of fungi, lichens, bryophytes, arthropods, and vascular plants, and will likely include vertebrate species such as small mammals and amphibians, and various bird species. Isolated patches will function as refugia where old-growth associated species are able to persist until conditions become suitable for their dispersal into adjacent stands. Loss of these old-growth stands may result in local extirpation of an array of species. It is prudent to retain what little remains of this age class within landscape areas where it is currently very limited. This will ensure future options for management and enhancement of the diversity within adjacent developing stands.

Landscape areas where little late-successional forest persists should be managed to retain late-successional patches. This standard and guideline will be applied in fifth field watersheds (20 to 200 square miles) which are currently comprised of 15 percent or less late-successional forest. This assessment should include all allocations in the watershed. Within such an area, all remaining late-successional stands should be protected. Protection of these stands could be modified in the future, when other portions of the watershed have recovered to the point where they could replace the ecological roles of these stands.

In fifth field watersheds that contain more than 25 percent nonfederal land, this provision should be treated as a threshold for analysis rather than a standard and guideline. If less than 15 percent of the total landscape in such watersheds consists of late-successional forest, the role of those stands must be recognized. A proposal to modify such stands should only be implemented following a watershed analysis that considers the ecological function of the remaining late-successional forest and its location in the landscape.

In Adaptive Management Areas, less than 15 percent of fifth field watershed in late-successional forest should also be considered as a threshold for analysis rather than a strict standard, and the role of remaining stands of late-successional forests must be fully considered in watershed analysis before they can be modified.

Northern Spotted Owl Activity Centers.

This standard and guideline institutes a recommendation that was contained in both the Interagency Scientific Committee (ISC) Conservation Strategy for northern spotted owls and the Final Draft Spotted Owl Recovery Plan (USDI unpub.). The standard and guideline applies to spotted owl activity centers that are not protected by Congressionally Reserved Areas, Late-Successional Reserves, Riparian Reserves, Managed Late-Successional Areas, or Administratively Withdrawn Areas. One hundred acres of the best northern spotted owl habitat will be retained as close to the nest site or owl activity center as possible for all spotted owl activity centers known to occur in the matrix and Adaptive Management Areas as of January 1, 1994. This is intended to preserve an intensively used portion of the breeding season home range. "Activity center" is defined as an area of concentrated activity of either a pair of spotted owls or a territorial single owl. Timber management activities within the 100-acre area should comply with management standards and guidelines for Late-Successional Reserves. Management around this area will be designed to reduce risks of natural disturbance. These areas are to be maintained permanently, subject to normal changes through adaptive management.

Protect Sites From Grazing.

This standard and guideline is designed to benefit mollusks, arthropods, and vascular plants. Known and newly-discovered sites of these species will be protected from grazing by all practicable steps to ensure that the local populations of the species will not be impacted. This standard and guideline may apply throughout all land allocations. Species to be protected through this standard and guideline are:

Arthropods: Litter and soil-dwelling species (south range)

Mollusks: *Ancotrema voyanum, Monadenia fidelis klamathica, Monadenia fidelis ochromphalus, Pristiloma articum crateris, Fluminicola n. sp. 1, Fluminicola n. sp. 11, Fluminicola n. sp. 19, Fluminicola n. sp. 20, Fluminicola n. sp. 3, Fluminicola seminalis*

Vascular Plants: *Pedicularis howellii*

Manage Recreation Areas to Minimize Disturbance to Species. This standard and guideline will benefit a number of fungi and lichen species whose known locations are predominantly within established recreation sites. This standard and guideline falls within the category of the survey and manage standard and guideline above, and species to be protected through this standard and guideline are among those shown in Table B11-1. This standard and guideline may apply throughout all land allocations. Additional information on the habitat requirements of these species are discussed in Appendix J.

Other Measures. This category includes additional site-specific standards and guidelines that will be implemented to provide for sites under the survey and manage standard and guideline. Such measures have been identified for some of the mollusk, fungi, and lichen species. This standard and guideline falls within the category of the survey and manage standard and guideline above, and species to be protected through this standard and guideline are among those shown in Table B11-1. It may apply throughout all land allocations. Additional information on the habitat requirements of these species are discussed in Appendix J.

Table B11-1. Species to be protected ... (Next 13 pages).

Appendix B
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